

FRIDAY, MARCH 23, 1883.

*THE SPHERE OF THE UNITED STATES
GEOLOGICAL SURVEY.*

EVER since the establishment of the U. S. geological survey, in 1879, there has been a question as to the extent of the territory subject to its researches. The legislators who framed the organic law intended to make the field of investigation co-extensive with the United States; but they failed to employ unmistakable language; and the officer on whom devolved the interpretation of the law construed 'national domain' to mean only those states and territories in which are public lands. It seemed to those interested in the work, that this restriction was unwise; and a resolution to remove it was introduced in the next Congress. The House acceded without a dissenting voice, but in the Senate the cry was raised that state rights were being invaded. A political discussion ensued, and the proposition failed to reach a vote. In 1882, however, the paragraph appropriating money for the survey was so altered as to extend its operations to the whole country; at least, so far as is necessary for the preparation of a general geological map.

Under the authority thus granted, several new works have been initiated, and two investigations already begun have been carried into new territory. Of the new undertakings, the most important are geographic. Three topographic parties and one triangulation party were sent to the Appalachian mountains in North Carolina, and adjacent portions of Tennessee, Kentucky, Virginia, and West Virginia; and a base-line was measured in Arkansas as a first step toward the mapping of the Ozark mountains. An investigation of the mesozoic strata of eastern Virginia, North Carolina, and Maryland, already begun by Prof. William M. Fontaine, was taken up by the survey; and a beginning was made in the study of the Orange Sand of the Gulf States. The works previously instituted, but now extended to new ground, were the study of the northern drift, by Prof. T. C. Chamberlin, and

the study of the copper-bearing rocks of the Lake Superior region, by Prof. R. D. Irving.

The temporary restriction to which the survey was subjected led to a free discussion, not only of the constitutional competence of the nation to investigate the mineral resources of the states, but of the proper functions of a scientific survey endowed by the government, and of the relative functions of national and state geological surveys. The fact was developed, that the directors of the existing state surveys, almost without exception, favored the establishment of a national survey, but that the wisdom of the measure was questioned by several geologists not directly connected with state work. The chief ground of objection appeared to be, that the local interest essential to thorough local work could be best secured by local organizations; the chief ground of support, that the work in each state must develop scientific problems soluble only by investigations carried beyond the lines of the state. Those who recognize both these considerations hope that the inauguration of the national work will not be followed by any abatement of state work. Certainly there is ample room for both; and a national survey is no more competent to discuss local questions than are state surveys to answer those of a general nature. With a proper differentiation of function, there need be no more overlapping of work than is necessary to promote salutary discussion. So far as indicated by its initial work, the national survey purposes to confine its attention to researches the subjects of which lie in several states, and the results of which have more than a local interest. Professor Irving's investigation of the copper-bearing rocks leads him, of necessity, into three states; and Professor Chamberlin's study of the great moraine marking the second division of the glacial epoch, has carried him and his assistants into thirteen states and one territory. The scientific value of a national organization is especially illustrated by the latter work. While Professor Chamberlin has had the advantage of a great body of published material, he nevertheless owes to the U. S. survey the opportunity of tracing, and uniting

into one continuous chain, some three thousand miles of terminal moraine. If this comprehensive view had been possible to some geologist twenty years ago, how different might be the literature of our drift!

IMPROVEMENT OF THE NATIVE PASTURE-LANDS OF THE FAR WEST.

It is a well-known fact, that the greater part of the United States west of the meridian of Omaha is unfit for tillage. Here and there, there are strips of land, which have a larger rainfall, that may be brought under the plough; and along the rivers there are narrow belts of land that may be made tillable by irrigation. A portion of this region is utterly barren; but a large part of it—probably not far from one million square miles of the whole area, or an area nearly one hundred times the surface of Massachusetts—bears a scanty crop of grasses. The natural use of this region is already recognized: its sole worth is for the pasturage of cattle and sheep. Already a great herding industry has been created in this region,—one that has an important bearing on the food-supply of this country and of Europe. The only limitation on the great extension of this industry is found in the scantiness of the herbage and the inadequacy of the water-supply. The latter evil is probably remediable, in most cases at least, by wells or by storage-reservoirs, which shall retain the abundant water-fall of the rainy season. I propose to offer some suggestions concerning the possibility of bettering the herbage of forage-plants.

All the grasses that now grow in that region make but a scanty herbage. I am informed by stock-raisers, that the best 'ranges' require from fifteen to twenty acres to a head of horned cattle, and that from this unusual goodness the 'ranges' decline in value, until, in many districts, a hundred acres is required to supply a beast. The wide extent of the ranges necessary to afford pasturage to herds of profitable numbers makes the supply of water more difficult than it otherwise would be.

It seems to me possible that the pasturage of this region might be materially improved by the introduction of grasses and other forage-plants indigenous to regions having something like the same conditions of climate. My reasons for hope in this matter are substantially as follows: the experience of settlement in this country shows that the grasses are more easily feralized than any other of our domesticated plants; several of them show a

willingness to escape to the wilderness; so that there is hope that a careful selection in various lands might afford some other species that would run wild on our dry plains and mountains. European experiments in naturalizing grasses have been fairly successful, as in the case of grasses to protect dunes from the action of the wind.

There are many regions in the world where grasses have developed to suit just such conditions as we have on our plains; and in some of those regions the period for the process of development to go on has been far longer than in North America. In North America it has been but a single geological period since the vegetation of the plains and Rocky Mountains was well watered; while in Australia it seems likely that the dryness of the climate has been in existence from a rather remote past. The same is probably the case in the northern parts of Asia and in South Africa. Good effects from the introduction of foreign forage-plants may be hoped for, if the only result were an increase in the variety of the herbage on the plains. With the poorest grasses there are generally wide interspaces between the tussocks of high-growing species. If these intervals could be filled with other forage-plants, the consequence would be a greater amount of food to the acre.

In the effort to naturalize foreign species of forage-plants, attention should be paid to all forms of plants that can afford pasturage or browsing. There are many forms that would be likely to do well along the streams, that might not succeed so well in the open country.

The regions that are likely to furnish plants calculated to flourish in a region of low rainfall include a large part of the earth's surface. Those that would succeed in Dakota are not likely to do well in Texas or Arizona. For the northern region, the uplands of northern Asia or of Patagonia are the most promising fields of search; while, for the middle and southern fields, the valley of the La Plata, southern Africa, Australia, and the Algerian district, may be looked to for suitable species.

The experiment is naturally one for the federal government to undertake, but it need not be costly. Three experimental stations—one in the northern part of Nebraska, one in Texas, and one in Arizona—would serve the needs of a thorough trial. Ten thousand dollars per annum at each station should meet all the expenses of a sufficient trial; at least, until it was proven that the experiment would be successful. If we add the expenses of a travelling student of wild forage-plants (perhaps

another five thousand dollars), we would have a sufficient basis for practical work. If the result should be to increase by only one-tenth the beast-maintaining power of our wild lands, the effort would be worth many millions per annum to the nation. When we consider that the introduction of the species of *Poa* which receive the name of 'blue-grass' has manifolded the pasturage-value of the regions where it flourishes, it is evident that the project is worth consideration.

N. S. SHALER.

HISTORY OF THE APPLICATION OF THE ELECTRIC LIGHT TO LIGHTING THE COASTS OF FRANCE.¹

III.

As the electric installation at the Planier lighthouse is the newest and most complete, some further details of its arrangement will be of interest. The plan (Fig. 7) shows clearly the position of the two generators, and of the transmission-shafting which sets them in motion.

Both generators are placed upon the same masonry foundation, and their axes are in the same line. In order, however, that one may be ready to replace the other in case of accident, their shafts are keyed together; and they both turn, the one with an open, the other with a closed circuit. Between the two machines is a short column (shown in Figs. 9 and 10), which supports the guides for changing the belts from the loose to the fixed pulleys.

Each machine is divided into two circuits, shown by four terminals placed at the upper part of the frame, two at each end. The two

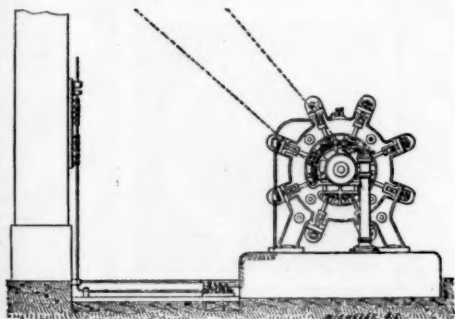


FIG. 9.

terminals placed beside each other at each end of the machine are those which at a given instant form poles of the same name. From

¹ Continued from No. 6.

each of them is led a copper conductor to the foot of the machine; thence, along the masonry foundation, it follows the ground (as shown in Figs. 9 and 10), and arrives at a commutator

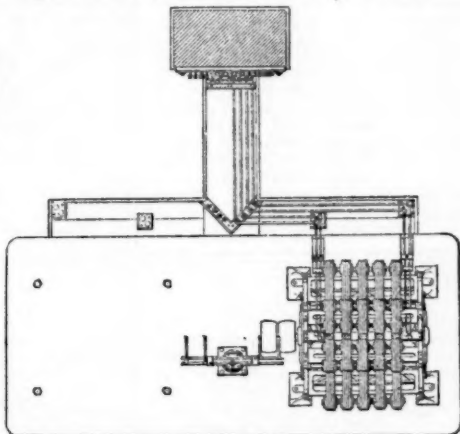


FIG. 10.

placed on the masonry column, which forms one support of the shafting. One object of the commutator is to take the current at will from either machine; another is to couple, either in tension or quantity, the two circuits of each machine. The four possible combinations of the commutator are shown in Fig. 11. An examination of this figure shows that the apparatus consists of fixed and movable contacts arranged in a circle. The first are fourteen in number. The four on the left are in relation with the terminals 1, 2, 3, 4, from which are led the conductors of the machine on the left, or machine No. 1. The four on the right are connected with the terminals corresponding with the conductors of machine No. 2. The three upper contact pieces are attached to the terminals communicating with the conductors of the lamp.

It should be said, that the current reaches the lamp by a large cable, then, after traversing the arc, is divided between two smaller cables, in one of which is placed the electro-magnet of the lamp. Of the three upper contacts, that of the left communicates with the terminal E, to which is connected the cable of the electro-magnet just mentioned; the next belongs to the terminal P C, of the second small cable; finally, the right contact, twice as large as the others, is in communication with terminal G C, of the large cable. This system of fixed contacts is completed below by three pieces,

the centre one having double the length of the others. The side-pieces communicate by means

terminal, rest the two movable contacts by which the current returns to the terminals 3 and 4.

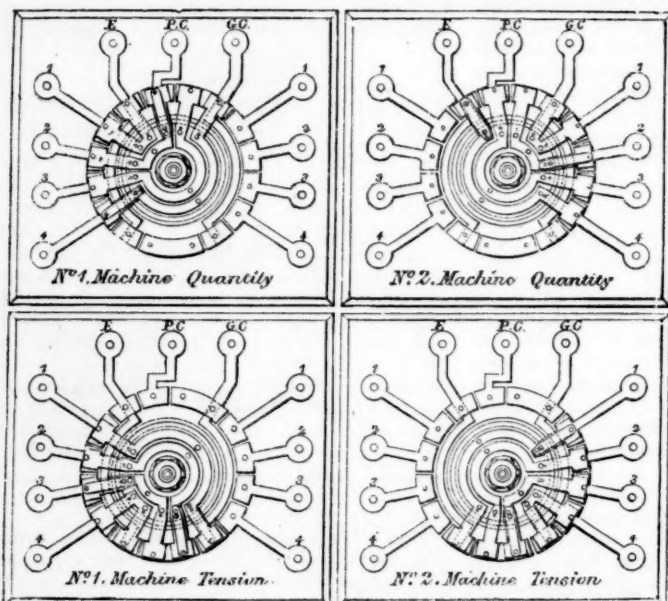


FIG. 11.

of auxiliary conductors, — that on the left with the contact piece of the terminal E, that on the right with the contact piece of the terminal G C.

The movable contacts, to the number of eight, are shown in the figure. They are all carried on one plate, free to move around the centre of the apparatus. The two innermost contacts are connected together so as to form a sort of U; the next pair forms a larger U; and the four others are connected, two and two, by circular strips. The different pairs of contacts are, of course, insulated from each other. A handle in the centre of the movable plate serves to place it in different positions.

Suppose, for example, that the movable contacts are in the first position shown in the figure for quantity. The terminals 1 and 2 being, at the same instant, poles of the same name, the current enters simultaneously by the two movable contacts corresponding to these terminals, and passes at the same time into the small cable and the cable in which is the electro-magnet. After passing the carbons, it is reunited in one conductor, and returns by the large cable to the terminal G C. On the fixed contact of double size, in connection with this

movable contacts, it arrives at the large, lower, fixed contact, from which it is conducted by the

In coupling for tension in the same machine, the current, leaving the first circuit of the machine by the terminal 1, traverses the most open pair of movable contacts, and arrives at one of the lower fixed contacts by means of the conductor auxiliary to the contact G C. It then follows the large cable, passes through the carbons, and only traverses the small cable of the electro-magnet to arrive at the terminal E; thence, by the second auxiliary conductor, to the smallest pair of movable contacts and terminal 4. It then traverses the second circuit of the machine, and returns to the terminal 3. Afterwards, by the second pair of

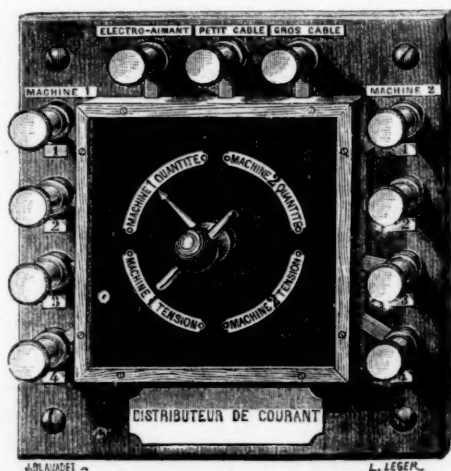


FIG. 12.

third pair of movable contacts to the terminal 2; that is to say, to the first circuit of the machine.

In examining the positions of the movable contacts shown for coupling machine No. 2 for tension or quantity, it will be seen that the direction of the currents is similar.

Fig. 12 gives a perspective view of this commutator. The contacts are covered with an ebonite plate, through which passes the handle for manipulating the movable plate. This ebonite plate bears four inscriptions, corresponding to the different combinations of the commutator; and an index moving with the handle indicates the combination in use.

This system has the advantage of changing instantly the grouping of the two circuits of the same machine, and of quickly substituting one machine for the other. It has, however, the drawback, common to all turning-contacts, of not being absolutely reliable.

THE HEAD-HUNTERS OF BORNEO.

IN AN octavo volume of three hundred and thirty-seven pages, Carl Bock describes his journeyings into the interior and across the island of Borneo and in the island of Sumatra. The trip across Borneo, of which the book mainly treats, was undertaken at the instance of the governor of the Dutch Indies, for the purpose of making a report upon the native races of the interior, and of gathering collections of the fauna.

The author describes well; and those who read for amusement and general information will not only find the book entertaining, but will derive an excellent idea of the chief features of Bornean scenery, of its strange animal life, of the character and peculiarities of the natives, and of many curious phases of human life under the exceptional conditions of this tropical island. Scattered through the first fifteen chapters, or what may be fitly termed the diary of the trip, are very many interesting facts and observations of value to the anthropologist. But the subsequent chapters more particularly interest him, being devoted to a consideration of the province of Koetoei, and of the Dyak tribes inhabiting it. The second part treats of a limited sojourn in Sumatra, and is by far the less important, as it is the smaller portion of the volume.

Borneo is stated to be inhabited by Malays, Boegis, a couple of hundred Chinamen, and a few Klings, and by Dyaks. The Malays are chiefly confined to the coast. The Boegis, emigrants from the south part of the Celebes, are settled in one district (Koetoei), 'where they are getting numerous and powerful.' The Dyaks, who are split up into numerous independent and hostile tribes, occupy the interior of the island.

Perhaps the most important contribution to anthropologic knowledge made by Mr. Bock, is his account of the Orang Poonans, or forest people, whom he believes to be the aboriginal inhabitants of Borneo, and who are not only distinct from the neighboring Dyaks, but, in their intercourse with them, do not appear to have adopted their habits. Meeting some of the Poonan men at Long Wai, a Dyak village, he succeeded in inducing one of the chiefs to escort him to his forest home, where, however, his observations were limited to a single afternoon. According to the picture presented by the author, the Poonans would seem to be in the lowest stage of savagery. He found them almost destitute of clothing, without pottery,

with few utensils (and of the simplest kind); and he confirms the belief, current in the island, that they build no dwellings properly so called, but live day and night in the open air, with no better shelter in showery weather than that afforded by an attap mat. It is possible that a longer and more intimate acquaintance with this wild people would have led to the discovery of tokens of a higher culture. The skin of the Poonans, particularly of the women, now seen by a European for the first time, is 'somewhat fairer than that of the other Dyaks,'—a result, as the author doubtless correctly surmises, of their residing in the dark forest.

A curious industry of the people is the collection of bezoar stones, which are used by the Chinese as a cure-all. The bezoar stones are of two kinds: one is derived from an external wound on a porcupine, and is supposed by the author to be composed of bits of leaves, etc., formed into a ball by the congealed blood; the other is said to be a gall-stone, found in different parts of the boehis monkey, *Semnopithecus cristatus*.

Head-hunting, as practised by all the Dyak tribes, is asserted to be, on what appears to be sufficient evidence, part and parcel of their religious rites. Birth and namings, marriages and burials, not to mention less important events, cannot be properly celebrated, unless the heads of a few enemies, more or less, have been secured to grace the festivities or solemnities. "Head-hunting," says the author, "is the keystone, so to speak, in the edifice of Dyak religion and character. Its perpetual practice is, no doubt, one great cause of the rapid extinction of the race."

Naturally enough, a practice so deep-rooted as this, has proved, and must continue to prove, the one great obstacle to be overcome in attempts to civilize the Dyaks.

While all the Dyaks are head-hunters, only one of the tribes, the Bahou tribe, practises cannibalism. Human flesh is eaten mainly at the feasts that follow a successful head-hunting expedition. The form of anthropophagy here disclosed seems to be somewhat analogous to that which obtained among the North-American Indians, not a few tribes of whom partook of the flesh of enemies, especially when the individuals slain were greatly renowned. At the same time, it is stated that these cannibal feasts are also given in celebration of various events, such as on the occasion of the death of a chief. Moreover, not only are the prisoners of war sacrificed, "but the richer members of the community give a number of slave-debtors (i.e., those who are sold into slavery to work out debts) to be put to death by slow torture, and eaten."

'Pomali' is a practice in vogue among the Dyaks, and also among other natives of the Malay archipelago, which seems to be somewhat allied in its nature to the tabu of the South-Sea Islander; although it appears to be less complex in its workings, and to cover much less ground, than that curious custom. As a sign that pomali is being resorted to, a bunch of maize is stuck in the ground, or baskets of rice are suspended from a bamboo post, when strangers are prohibited from entering the house or field thus pomalied.

Tattooing was found to be a common practice among the Dyaks, the women being the more elaborately ornamented. The method adopted by the professional tattooer is to first cut outlines of the intended pattern in wood, and then trace them on the body, when it is pricked in with a sharp-pointed piece of bamboo or a needle, dipped into a pigment prepared from vegetable dyes. Men are tattooed when they attain manhood, and women when about to be mar-

ried; tattooing being, with the female sex, one of the privileges of matrimony.

No communal practices appear to have attracted the author's attention; but the statement made, that among the Sandjoeng Dyaks there are only "a couple of houses in each village, but so large as to contain between them the whole population of 400 or 500," is of interest, since it carries with it the implication of some form of communal life. In another place these communal dwellings are described as from eighty to a hundred and sixty feet in length, twenty to thirty feet in width, and with walls about ten feet high, the ridge of the roof rising another five or six feet.

The house proper has but one floor, raised on posts of ironwood about fifteen or twenty feet from the ground, which forms the actual residence, under which is a second floor, from four to six feet from the ground, which serves for many domestic purposes, to hold councils in, and as a playground for the children.

The fact, that, "whenever a deer is killed, every inhabitant of the village receives a share," the one actually shooting the animal having the right to the horns, also clearly points to the existence of well-defined hunting-laws rooted in communal principles.

Judging from the description given, the Dyaks would seem to possess many savage virtues. They were found by the author to be singularly temperate both in eating and drinking. The only native intoxicant is 'toewak,'—a drink made from wild honey. When offered brandy, they refused it, exhibiting a strong distaste even to its odor; nor could they be induced to more than taste it. They indulge to excess, however, in betel-chewing, — a habit for which they are indebted to the Malays.

In mental capacity the Dyaks are stated to be on an equality with the Malays; but they are more energetic, and more willing to work. The author attests their truthfulness, and states that thefts and robberies are entirely unknown among them. On the other hand, they were found to be most importunate beggars.

The chief industrial occupation of the Dyaks is stated to be agriculture, both sexes taking part in the labors of the field. As usual, the heavier portion falls to the lot of the women, who are said to be 'the only beasts of burden.' Rice is the main crop; but bananas, sugar-cane, and a few coconuts are also raised. The production, however, only suffices for immediate wants, and in times of drought great distress always ensues.

The cutting of rattan to supply the Malay trade is the next most important occupation. Considerable quantities of gutta-percha are also collected, but in so wasteful a manner, as, in the author's opinion, to threaten the future supply.

The gathering of wax from the nests of the indigenous bees is also an important industry; and twice a year the edible nests of the swallow (*Hirundo esculenta*) are collected for sale to the Chinese.

The medical practices of the Dyaks appear to be strictly analogous to those of other savages. Certain plants are employed as remedies; the task of concocting the medicine, and administering it, devolving mainly, as appeared to the author, upon the women, who also do what nursing is required. The main reliance, however, for the cure of disease, is in charms and sorcery.

Curiously enough, symptoms of the prevalent Darwinian theory seem to have penetrated these far-off regions; and, while visiting a village of Dyak in the interior, the author found a strong belief in the ex-

istence of people with tails in a country but a few days distant. To use his own words, "such definite statements were made to me on the subject, that I could hardly resist the temptation to penetrate myself into the stronghold of my ancestral representatives." He contented himself, however, with hiring one of the natives to go in his stead, with, needless to say, quite unsatisfactory results.

In appendices are given lists of land and freshwater shells collected by the author in Borneo and Sumatra, with descriptions of new species; a list of birds collected on the west coast of Sumatra; a list of Sumatra butterflies; and a short vocabulary of the Long Wai (Dyak) dialect.

The volume is copiously illustrated with lithographic plates from the author's original drawings. These, if not remarkable for artistic excellence, yet serve well the purpose for which intended.

GEOLOGICAL MAP OF BELGIUM.

THE appearance of the first sheet of the new *Carte géologique de la Belgique, dressée par ordre du gouvernement* introduces to us a new system of geological cartography, which in many respects is more perfect than any thing yet attempted by a geological survey. The system adopted shows truly the real geology of the country, but gives an imperfect idea of the general distribution of the strata. This, however, can be readily shown on maps of a much smaller scale. The sheet which has just appeared is that of Cinney: it is on the scale of 1:20,000, the topography being indicated by 10-metre contour lines. The outcrops are drawn as they are found, and colored with even tints. The theoretical limits of the strata are defined by degraded tints of the same color as that used to designate the outcrops of the same formation. If two outcrops are visible (as with the carboniferous limestone, which is locally covered with sands), the diagrammatic extension of these is represented by fine dots of the color of the sands. The light colors in even tints are, on the contrary, reserved to represent the general disposition of the superficial quaternary and modern deposits. These have been studied carefully, especially with the help of borings; and the lettering on the map indicates the exact spot of each sounding. A short, straight, black line is used to represent the strike of the beds; and a small point, like an arrow-head, projecting from it, indicates the direction of the dip, while a number engraved on the other side of the line shows its angle. Forests where no outcrops are visible are left uncolored. Where the superficial deposits consist of the detritus of a known formation, the fact is indicated by equidistant broken lines of the same color as that used to designate the outcrop of which they are the waste.

Owing to the largeness of the scale, and the accurate topography of the maps of the war department, the geologists of Belgium have been enabled to make a true representation of the geology of Belgium as shown by the outcrops of rocks that are visible, and the superficial and surface deposits; placing on the map merely what is known and can be seen, without leaving any room for theoretical views of extension of formations to creep in and create errors, as they nearly always do. When the map is completed, it will consist of 430 sheets; besides which, there will be published a number of atlas-sheets of sections on a scale of 1:5,000. Accompanying each sheet of the map, an explanatory text will be published, containing a plate on which will be drawn three diagram-

matical sections cutting the map north and south at equal distances of twenty-seven hundred metres, showing theoretically for the whole country the subterranean distribution of the beds. In the tertiary formations an equal number of transverse sections will accompany the sheets. In the field-work, each formation will be studied monographically. One of the features of the reports will be the remarks on the subterranean hydrography. The present sheet has been prepared by the director of the survey, Mr. E. Dupont, for the carboniferous, and by Mr. Michel Mourlon for the Famennian or upper Devonian. In the accompanying text are a number of detailed sections printed on thin India paper, colored chromolithographically, and afterwards pasted in their proper place; there is also a small colored sketch-map showing the distribution of the formations in Condroz and Entre-Sambre-et-Meuse. The text is a large octavo of 66 pages.

The geological maps of Dumont have always been cited as models. By publishing the present map, the Belgian government preserves its high position as a leader in geological research. J. B. MARCOU.

LETTERS TO THE EDITOR.

Flight of the flying-fish.

In 1871 (*Proc. Bost. soc. nat. hist.*, xiv. 137), from observation of the flying-fish in the Central-American and Hawaiian Pacific, I expressed the opinion that their flight was something more than sustaining themselves in the air by a parachute-like membrane. In the Indian ocean, in 1882, they flew from before our steamer in immense numbers; and I had ample opportunity to watch them in smooth and rough seas, and am confirmed in the statement then made, that they have the power of directing their flight. Admitting that, as a general rule, their course in the air is a continuation of their onward and upward passage through the water, and its duration as long as the expanded pectorals are moist enough to permit the rapid vibrations by which they skim along near the surface, I am sure that they can, even without touching the water with their long, lower caudal lobe, turn to the right or left, rise or fall to avoid a wave, and change direction, almost like a bird. I have often seen them sustain a flight of over a minute by my watch, and traverse several hundred yards, apparently half a mile. Their lot seems a hard one. Exposed to porpoises, dolphins, and voracious fishes, in the sea, and to marine birds in the air (happily few in these waters), what appears mere joyous amusement is really a race for life. S. KNEELAND.

Use of wire in sounding.

Since preparing the memorandum on the early use of wire in sounding (*SCIENCE* No. 3, p. 65), my attention has been called to two other instances of its use. It appears that the wire used by Walsh was of steel, though this is not stated in the log-book. And, in addition to the ten-pound sinker, there was a registering apparatus of six pounds' weight, designed by Maury, used on at least one of the casts, according to Capt. Belknap, but not mentioned in the record.

In the same year in which Walsh made his preparations, Capt. Barnett, R.N., of H. M. S. *Thunderer*, on her way to the Azores from America, sounded, August, 1849, with iron wire and a sixty-one pound sinker. Only one attempt was made, and the wire broke at 2,000 fathoms. It would seem possible, that, while the *Thunderer* was in America, some communication might have passed between the Ameri-

can and British naval officers which resulted in the attempts of Walsh and Barnett.

However, a still earlier attempt to employ wire was made, which, for the present at least, seems to be the earliest instance of its use. This was on the U.S. exploring expedition under Wilkes, when copper wire about three thirty-seconds of an inch in diameter, with twisted and soldered splices, appears to have been furnished to most of the vessels—at whose suggestion I have been unable to discover. The experiments were unsatisfactory, owing to constant parting of the wire; and, before the return of the expedition in 1842, the plan was abandoned. An admirable discussion of this topic, contributed by Capt. George E. Belknap, U.S.N., will be found in Hamersly's *Naval encyclopaedia* (Philadelphia, 1881).

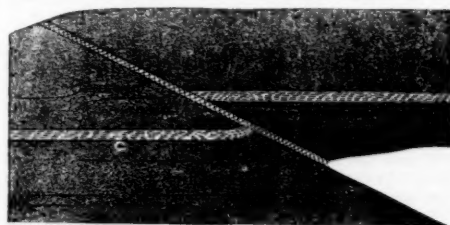
WILLIAM H. DALL.

Peculiar faulting of a coal-bed.

In a drift opening in the Pittsburgh (Ohio No. 8) coal, near this place, there is exposed a rather exceptional faulting of that seam.

The fault occurs ninety yards from the mouth of the mine, where about forty feet of strata lie over the coal. The slope of the surface is quite uniform from the opening to the point of fault, whence the rise is more rapid for a short distance, when the surface becomes a level ridge, from which it falls in all directions.

In the accompanying cut of the fault, which is longitudinal in relation to the entry, the horizontal



dotted space represents the 'inbearing vein,' so persistent in the Pittsburgh coal. The sloping checkered space represents the pulverized smutty coal on the line of fault, having a slope of about 30°. The bottom coal is very uniform as to thickness, except at the fault, where, from duplication and crushing in a horizontal direction, it is considerably thickened. The condition of the top coal is very different. From the fault to the mouth of the mine it varies from 12 to 20 inches, with a roof of slickensided 'soapstone,' while, immediately beyond the fault, it assumes a very uniform thickness of 30 inches.

On the east or under side of the fault, the edges of the layers of coal and slate partings are undisturbed, even immediately in contact with the crushed line. On the west side the layers and partings are all bent down where they come to the line of fault, as shown in the cut, in which the dark lines in the body of the coal represent slate-partings. Some of the layers of coal are pursed and distorted where they come to the fault. The immediate contact of the fault with the underlying fire-clay is concealed by a tramway. At all other parts of the fault, where it crosses the entry, its character is very plain. The wedge-shaped edge of the upper coal is cut off very abruptly at the line of fault, as prolonged at its normal slope up into the shale. The 'inbearing vein' is about twelve inches

higher on the west side of the break than on the east side, and duplicated by the lateral and upward thrust for nearly two feet before it droops to and passes into the smutty coal of the break.

From what is exposed, it appears that a part of the upper hill, at least down to and including the coal and fire-clay, has, from some cause, moved on the underlying strata; and at the fault the coal-bed has been broken and forced upon itself for two or three feet. The coal next the mouth not partaking of the motion of that farther in the hill, I could find no detritus of the removed part of the top coal, 10 to 18 inches of which is wanting from the opening to the fault. This would tend to prove that the faulting might have occurred in carboniferous times. The exposure of the roof-shales is not sufficient to prove the absence of such detritus. The condition of the coal at the line of fault would point to a geologically recent date of disturbance. Jefferson county is outside the region of glacial drift. SAMUEL HUSTON.

Richmond, Ohio.

The Leadville porphyry.

In the American naturalist for November, 1882, I find the following note:—

"The so-called *Leadville porphyry*.—Professor Alexis Julien read a paper at the Montreal meeting of the American association, on this subject, in which he described the result of his examination of the rock in question, in thin sections under the microscope. He finds that it is not an eruptive rock, but is sedimentary. Its material consists of the *débris* of the erosion of plutonic rocks redeposited in the Silurian ocean. He concludes that the rock is not a porphyry, but must be called a felsite tufa. The importance of this conclusion in estimating the form of any metallic ores contained in this deposit is obvious, and will be invaluable to mining experts."

Having spent the better part of two years in a detailed study of the Leadville region, an abstract of the results of which was published about a year since, I feel it my duty to correct any misapprehension which may arise from the above statement. The paper to which it refers I have not yet been able to see, and cannot, therefore, tell exactly to which of the many varieties of porphyry occurring at Leadville Professor Julien refers. I have seen slides of his in the possession of a gentleman at Leadville, which I have reason to believe were made from specimens of the rocks to which I gave the local name of 'gray porphyry,' and which had been labelled by him 'felspathic gneiss.' To whatever porphyry he may refer, however, I have no hesitation in saying, that his microscopical determinations have led him utterly astray. On what ground he decides from the simple inspection of a thin section of a rock of this character, whether it is sedimentary or eruptive, I am unable to conceive. Microscopical lithologists in Europe, and their pupils in this country, hesitate to do this without the aid of field-observation; and, as far as I know, it is only a few Americans who have obtained their knowledge of this science independently of such adventitious aid,—and who therefore, in their own opinion, know much more than those who originated the science,—that feel themselves competent to decide on the character of a rock without any knowledge of its field-habit or mode of occurrence. The mischievousness of this assumption is illustrated in the present case, where an utterly mistaken statement is given to the public by one whose name and position should be guarantees of scientific accuracy. Quite aside from any microscopical evidence,—as regards which, it is unnecessary to say, I differ essentially from the above-quoted statement,—all the *Leadville porphyries* are most distinctly eruptive. They occur largely as sheets between sedimentary beds, it is true; but they also cross these beds, occur as dikes, and

carry within their mass larger or smaller portions of the enclosing sedimentary beds, as caught-up fragments.

To the writer of the above-quoted article, I would say, that, though in one sense a mining expert myself, I fail to see any possible use which Professor Julien's conclusions, had they been correct, would have been to me 'in estimating the form of any metallic ores contained in this deposit,' even had the Leadville ores been contained in porphyry, which, as a rule, they are not.

S. F. EMMONS.

U. S. geological survey, Washington, D. C.

Sand-tracery.

My attention was called last fall to the curious markings, formed chiefly by the agency of plants and wind, on the beach of Lake Champlain. Seeing a notice of similar phenomena observed on the seashore by a correspondent in the second number of SCIENCE, I would add the following, which tends only to confirm some of his statements:—

In passing over the smooth beach of Burlington Bay, one is struck, first of all, by the porous condition of the sands just outlying the portions within reach of the waves. Unacquainted with this appearance, he might attribute it to some sand-boring insect, did not a closer observation teach him at once that it was effected by the spray, and due to the bursting of air-bubbles. The sand sifts over these holes until they are entirely concealed, or only a small opening is left, out of which one might not be surprised to see an insect emerge at any moment. He would also notice numerous tracings referable to the tracks of small animals. These are frequently regular and clean cut, and resemble impressions which are seen in the triassic sandstones of the Connecticut river. Again: a little observation stands one in good stead, as it shows these to be made by dry frizzled algae, rolled onward by the wind, as was remarked in the letter above referred to, or successively raised and dropped, making still more deceptive impressions. A leaf is often trundled along by a slight breeze, indenting the sand in a very regular, though seemingly fantastic manner.

Furthermore, I have frequently noticed a curious print made by the pliant stem of an alga, which had become attached at one end. The remaining portions, being at the sport of the wind, describe concentric circles at every point of contact. I thought at the time how little imagination would be required to endow such simple examples of nature's geometry with the higher characteristics of plants and animals. Would it not be worth while for some one who has the opportunity and leisure to make a comparative study of these markings, and determine how many of such trifling phenomena have been exalted higher than they deserve?

F. H. HERRICK.

Burlington, Vt., March 1, 1883.

WHITNEY'S CLIMATIC CHANGES.¹

III.

THE second part of this article discussed the relation of a general change of atmospheric temperature to glaciation. We now come to consider its relation to desiccation.

Because all precipitation depends on evaporation, and because rate of evaporation di-

¹ Concluded from No. 6.

minishes with the lowering of temperature. Professor Whitney conceives that a general lowering of terrestrial temperature by reason of the dissipation of solar energy will make the arid regions of the earth more arid; and he therefore cites the drying-up of rivers and lakes in regions already exceedingly dry as evidence of a general lowering of temperature. By approaching the subject from a different side we may reach a very different conclusion.

If terrestrial warmth, instead of emanating from a single celestial body, were due to an equable radiation from the whole sphere of space, there would be no atmospheric circulation. The whole air would be saturated with moisture, and the whole surface of the earth would be wet; but there would be no precipitation, no evaporation, no streams. We may therefore consider saturation the normal or static condition of the air, and wetness the normal condition of the land. The actual inequality of extraneous radiation—the relative intensity of solar radiation—is a disturbing factor. It produces atmospheric circulation, thereby causing precipitation, and diminishing the humidity of the atmosphere so that evaporation becomes possible. Precipitation is the necessary condition of evaporation. By precipitation and evaporation, inequalities are introduced in the distribution of moisture upon the surface of the land. Where precipitation preponderates, the condition becomes moister than the normal; where evaporation preponderates, it becomes drier. Excessive aridity, therefore, as well as excessive humidity, is caused by solar heat; and every increase of solar radiation tends to magnify the contrast between moist regions and dry regions, making the moist moister and the dry drier.

If our author has fallen into error in his fundamental postulates, we need not be surprised to find that facts have proved stumbling-blocks to him, and that he has involved himself in numerous inconsistencies. It will be profitable to call attention to some of these.

On p. 341 he asserts that the recession of the glaciers of the Alps is part and parcel of a general phenomenon of desiccation; and this desiccation his theory ascribes to a general lowering of temperature. On pp. 240 and 296 he notes as evidence of this same lowering of temperature the extension of glaciers in Iceland and the increased abundance of icebergs in the north Atlantic. Thus the extension of glaciers in one region, and their shrinkage in another, are both assigned to the same degradation of climate.

Having asserted that the phenomena of the

glacial epoch in Scandinavia had their origin in local causes, and that the cognate phenomena, not only in the Alps, but in the Pyrenees, the Vosges, and the Caucasus, were part of the same system of events, he nevertheless declares that the ancient glacial phenomena of the Himalaya, of New Zealand, and of the Sierra Nevada, are not of sufficient importance to call for special explanation. And yet the glaciers of the Himalaya and New Zealand have shrunk, since their greatest extension, more than those of the Caucasus and Pyrenees; and the system of glaciers that has disappeared from the Sierra Nevada was greater than that ascribed to the Vosges. If the lesser changes are worthy to have a cause assigned them, why should the greater be ignored?

It is stated that the precipitation on the Sierra Nevada was very great in tertiary time, and has since continuously diminished. At a very late geological date the valleys of the range were occupied by glaciers; and the explanation given is, that the precipitation was greater then than now. But no suggestion is offered in explanation of the fact that at an earlier period, when the precipitation was still heavier, there were no more glaciers than at present.

This instance may be classed with a number of others, in which phenomena consistent with his theory are looked upon as systematic, while those of an opposite character are regarded as temporary or unimportant. The rise of the lakes of the Great Basin, since the first observations thirty-five years ago, appears to him a temporary oscillation; but the fall of the Lake of Valencia during a period of fifty years is made one of the proofs of a general desiccation, and the subsequent rise of the same lake does not find mention. The recent recession of the glaciers of the Alps is referred to a secular and general cause; but the contemporaneous advance of the glaciers of Spitzbergen is assigned a local cause, while the advance of the glaciers of New Zealand is ignored. The semi-periodic blocking of the Rofenthal by ice is mentioned as a curious anomaly, apparently without any realization that it points to a substantial uniformity of mean conditions for a period several times longer than that of the glacial recession upon which stress is laid.

One of the most curious features of the book is its assumption of the possibility of detecting evidence of a secular change of climate within the brief period of human history. To one who has the geologist's conception of geologic time the idea is so extravagant as to be fairly

grotesque. Let us consider it a moment. Silurian fossils have been found, not only in arctic and temperate regions, but within the tropics. By a slight exaggeration of the possible conditions of animal life we may admit that the general climate of the earth was then 50° C. warmer than at present. The lowest estimate that has been offered from the geologic or the astronomic stand-point for post-silurian time is five million years, which gives us a fall in temperature of one-thousandth of a degree in each century. Can it be that Professor Whitney thinks a change in temperature of one-thirtieth of a degree was sufficient to degrade Arabia from a centre of civilization to a desert? and to rob successively Persia, Greece, and Italy, of the prestige of empire? Has a change of one-hundredth of a degree so modified the climate of Greenland as to nearly depopulate it? Can it be that the same change has perceptibly modified the distribution of cultivated plants in France? Has a change of the two-thousandth part of a degree caused the Alpine glaciers to recede several thousand feet? and the Lake of Valencia to lay bare broad tracts for cultivation? And, finally, was it worth while to make a serious investigation of the thermometric data of the past century in the hope of detecting a change of the thousandth part of a degree?

TERRACES AND GRAVELS.

In one place or another our author states correctly all the fundamental principles of the action of rivers in erosion and deposition; but a strange fatality attends his application of them.

It is a conspicuous fact, that running water, under some circumstances, erodes its bed, and that, under other circumstances, it builds up its bed by deposition. The conditions which directly determine the performance of the one or the other of these functions are *load* and *velocity*. We may define the load of a stream as the ratio of its transported *débris* to the volume of its water. With a given velocity a stream is able to transport a certain load: an increase of load leads to deposition; a decrease, to erosion. Conversely, to transport a given load a certain velocity is required: an increase of velocity leads to erosion; a decrease, to deposition. Under ordinary circumstances the load of a stream at flood-stage is not subject to great variation; so that the determination of deposition or erosion is usually due to velocity. Velocity is a function of grade and volume. An increase in the angle of slope increases the velocity and tends to make a

stream erode; a decrease in the angle of slope tends to produce deposition. An increase in volume gives a greater velocity and tends to induce erosion; a decrease in volume diminishes velocity and tends to induce deposition.

It follows from this, that a stream which flows with so little velocity as to form a deposit in its valley may, by an increase of volume, be made to excavate its channel more deeply, and thus abandon its old flood-plain, leaving a portion of it as a terrace on the side of its valley. If, therefore, a stream be found bordered with terraces, and if there be good reason for the belief that the inclination of the valley through which it flows has not been changed, it is proper to infer that its volume was formerly smaller. By drawing the opposite and erroneous inference, Whitney has been led to see evidence of swollen streams—and therefore of excessive precipitation—where, in reality, none exists. In point of fact, river-terraces are nearly always produced by orographic changes; and it may be doubted whether there are any localities where the effect of orographic movements can be so far eliminated as to permit fluctuations in precipitation to be inferred from river-terraces.

If Whitney had escaped this error, it is possible that he might not have been drawn into a study of geologic climate; for it enters into his original discussion of the auriferous gravels. He there infers that the pliocene rivers were large, because they deposited their load high up on the flank of the Sierra; and that the modern rivers are relatively small, because they have carved cañons in the same region. It may, indeed, be true, that the pliocene precipitation and streams were relatively great; but these facts, so far as they have any bearing, point in the opposite direction.

If, however, we dismiss the idea that the behavior of these rivers was dependent upon their volume, we can find a more plausible explanation of the phenomena by referring them to change of inclination. If the inclination of the western flank of the Sierra was exceedingly gentle in pliocene time, it would be natural for its streams to form deposits on the lower slopes; and if afterward an elevation occurred, increasing this inclination, the habit of the streams would be reversed, and the cañons we see would result. That such a change in inclination has actually taken place is rendered probable by other considerations. In the first place, the western face, which is far broader than the eastern, is, as described by Whitney and others, an inclined plain, interrupted only by the narrow cañons of the

modern streams. Its plateau character is not given by a continuous stratum of hard rock parallel to the general surface, but has been produced by the uniform erosion of a system of plicated strata. Such uniform erosion could only have been accomplished by streams flowing at a low angle. Second, the eastern boundary of the range or plateau is a line of faulting; and the orographic movement producing the range consisted of a displacement along this fault-line, and a consequent inclination of the plateau-like mass to the westward. That this movement belongs to late geologic history is strongly indicated by the fact that it is incomplete. Some unpublished observations by Mr. I. C. Russell show that a part of it has occurred since the date of the quaternary lakes of the Great Basin; and the Inyo county earthquake brings it down to 1872.

If a rise of temperature is not favorable to glaciation, if a fall of temperature does not make deserts drier, and if river-terraces are not indicative of waning precipitation, it might seem that our author's theory is badly off; but the case is not hopeless. The paleontologic evidence, and the doctrine of the dissipation of solar energy, remain; and if he will now devote himself to the investigation of the glaciers that are known to have recently increased, to the dry countries in which civilization and wealth have supplanted barbarism and poverty, and to the rivers that are engaged in filling up the valleys they once excavated, he may yet find in recent history the evidence he seeks of a secular change.

G. K. GILBERT.

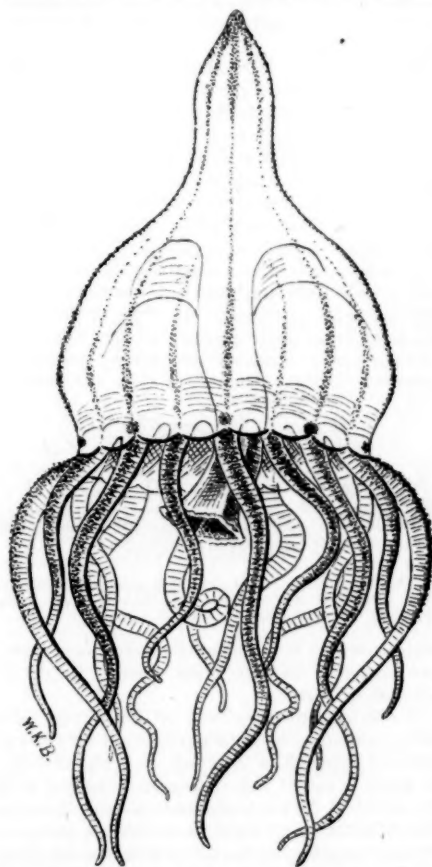
DEEP-SEA MEDUSAE.

Report on the deep-sea Medusae dredged by H.M.S. Challenger during the years 1873-76. By Prof. ERNST HAECKEL. London, 1882. 105 + 154 p., 32 pl. 4°.

THE expedition obtained only eighteen Medusae from deep water; and some of these, such as the beautiful Margelid, shown in plate 1, are undoubtedly surface-forms. But the value of the collection must not be estimated by its size: for some of the species are very primitive forms, or ancestral types, and are therefore of the greatest scientific interest; while others present unique and remarkable modifications of structure to adapt them to their life on the bottom.

Among the latter are the Pectyllidae, — a new family established by Haeckel, to include three genera of Medusae, obtained by the Challenger at a great depth in the Arctic Ocean, the Antarc-

tic the Indian Ocean, and the Mediterranean. They bear a close resemblance to the Trachynemidae; but they are furnished with great numbers of ambulatory tentacles, which are wonderfully like the sucking-feet of echino-



Tesserantha connectens in profile, ten times the natural size. Outline-sketch from Haeckel's *Deep-sea Medusae*, Pl. 15, Fig. 1.

derms, terminating, like these organs, in expanded sucking-disks. As Haeckel has obtained living specimens of the Mediterranean species, and has thus been able to supplement his account of the anatomy by observations of the living animal, we have an interesting account of its habits in confinement. He says that it usually lies on its back, extends a portion of its sucking-feet stiffly out around it, and thus attaches itself to the bottom of the glass: the other sucking-feet play freely in the

water, as if feeling and fishing for prey, while the open mouth projects vertically upwards. It also climbs the sides of the aquarium, using its feet like a starfish.

One of the most interesting deep-sea forms is *Tesserantha connectens*, one of the simplest and oldest representatives of the family Tesseridae.

In his *System der Medusen*, Haeckel has given his reasons for regarding this family as the primitive form from which all the Acraspeda are descended, and he has given a figure of this species in the same place. *Tesserantha* is little more than a Scyphostoma, which becomes sexually mature in this larval stage. Unlike a Scyphostoma larva, it is a locomotor form, which has become adapted to a free-swimming life by the change of its oral disk into a sub-umbrella, and its basal peduncle into an apical process. In place of the simple peripheric gastric space of the Scyphostoma, it has a chamber divided by partitions into four radial pouches. This interesting



Pectythis asteroides, anchored on its back, magnified ten diameters. Outline-sketch from Haeckel's drawing of the living animal, Deep-sea Medusae, Pl. 8, Fig. 7.

medusa, which is undoubtedly a deep-sea form, was captured in the South Pacific in 2,160 fathoms of water.

A magnificent specimen of *Periphylla mirabilis*, a mature male, was captured by the expedition, near New Zealand, in 1,100 fathoms of water; and it has furnished Haeckel with the material for a minute and valuable description (illustrated by eight plates) of the anatomy of this remarkable family, which shows many points of close relationship to the very simple and primitive Tesseridae and to the Cucernariidae, although it is in other respects the most highly organized of the coelenterates.

Half of the eighteen species of Medusae in the collection were Craspedotae, and half Acraspedae; and, as they represent eighteen genera and thirteen families, they present a great range of diversity, and represent most of the important types of medusa structure. Haeckel has therefore prefaced his description by a general introduction, which sets forth briefly and clearly the present state of our knowledge of the anatomy, histology, embry-

ology, and systematic zoölogy of the Medusae as a whole. This introduction, written in English, is of great value to those who are not specialists, but yet wish to know the results of modern research on this subject. It is only proper to point out to such readers the fact, that the paper contains many statements which are not accepted, without qualification, by all naturalists: such as the assertion (on p. xxv), that, "as the formation of the gastrula by invagination of the blastula in the Medusae has been observed in very different groups, we may assume that it happens universally in this class; and supposed exceptions (e.g., *Geryenia*) are founded on erroneous observation." Most embryologists would certainly hesitate to believe, without verification, that Metschnikoff's careful study of the development of *Liriope* involves a fundamental error; and many would be disposed to doubt whether the statement on p. xv, that the Ctenophorae are derived from an Anthomedusa (*Ctenaria*), is fully proven.

The presence of a number of uncorrected typographical errors also detracts from the value of the paper for general readers. For instance: p. viii contains the statement, that, "as regards the two sections or sub-classes, the Craspedotae are more probably of monophylitic origin; the Acraspedae, of polyphylitic;" while other sections especially devoted to this point (11 and 14) show that the author really holds the opposite view, and believes that the Craspedotae are of polyphylitic, and the Acraspedae of monophylitic origin.

Haeckel's very extensive and minute acquaintance with all forms of Medusae qualifies him, to an exceptional degree, for speculating upon the origin and ancestral relationship of the various orders and families; and his attempt to trace the evolution of the various forms is therefore interesting to all zoölogists. In sects. 10-14 he gives a phylogenetic classification of the Medusae, the outline of which is essentially as follows: the scyphy-polyps and hydro-polyps diverged from each other; and the latter became evolved along three divergent lines, thus giving rise to the tubularian hydroids, the campanularian hydroids, and a third imaginary 'trachylarian' hydroid, before any true Medusae were evolved. The Acraspedae are the descendants of the scyphy-polyps, of which their Scyphostoma larva is the ontogenetic recapitulation; while the three great groups of Craspedotae are the independent descendants of the three kinds of hydro-polyps, —the Anthomedusae (e.g., *Margelis*), from the tubularian hydroids; the Leptomedusae (e.g.,

Encope), from the campanularian hydroids; and the Trachomedusae (e.g., *Liriope*) and Narcomedusae (e.g., *Cunina*), from the 'trachylarian' hydroids. The resemblances between the Acraspedae and the Craspedotae, and the similarity between the various orders

of Craspedotae, he believes to be due to secondary modification, rather than to inheritance by descent from a common ancestral medusa.

He regards the Ctenophorae and the Siphonophorae as divergent stems from the Anthomedusae.

WEEKLY SUMMARY OF THE PROGRESS OF SCIENCE.

ASTRONOMY.

Astronomical applications of photography.—Prof. E. C. Pickering described some photographic work which is now being undertaken at the Harvard observatory. Experiments are being made with various lenses, and on their completion it is intended to take photographs of the whole visible heavens north of 30° south. It is possible, also, that a map will be published. Measurements of the photographic energy of all the brighter stars will be made, down to, perhaps, the seventh magnitude. Besides this, it is proposed to obtain measurements of the color of the stars by using a large lens of heavy flint-glass, giving as much chromatic aberration as possible. In the centre a circular disk of glass will be placed, slightly thinner at one edge than at the other. The effect will be, that every star will have two images placed side by side. By adjusting the sensitive plate at a certain distance from the lens the blue rays will be brought to a focus; but, in the case of the image formed by the rim of the lens, the violet and ultra-violet rays will be spread over so large an area as to produce comparatively little effect, while in the other image they will have nearly full power. By placing another plate somewhat nearer the lens the violet rays will be focused. A third plate will enable us to focus the ultra-violet rays. By comparing, in each case, the image formed by the edge of the lens with that formed by the centre, a series of quantitative results can be obtained, which will vary according to the spectrum of the star measured. By this method any variations of color as well as of magnitude could at once be detected. — (*Amer. acad. arts sc.; meet-* Feb. 14.) [412]

MATHEMATICS.

Riemann's theory.—The present paper, by Prof. Klein, is a continuation and generalization of the methods and results in his memoir, which appeared a year ago, entitled *Ueber Riemann's Theorie der Algebraischen Functionen*, etc. This last contained an extension of the Riemann theory of functions to arbitrarily given closed surfaces. There exist over these surfaces, as the author shows by physical considerations, certain potential functions, the relations between which, expressed in the language of analysis, afford the sought properties in the theory of functions. The physical considerations at first employed in order to obtain tentative results are now abandoned, and the author develops his new theory by more rigorous methods. Instead, now, of considering a Riemann's surface as a closed surface, he regards it as a bounded surface, or aggregate of bounded surfaces, where the different portions of the bounding curves may be regarded as being connected in pairs by any assigned law. A so-bounded surface is regarded as a portion of a closed surface; and the author shows how an important general principle is obtained, which he calls the principle of analytical develop-

ment, and which, in certain special cases, coincides with a principle of Schwarz called the principle of symmetry. The author shows how, by certain particularizations of the ideas, a general notion may be obtained of those functions which have linear transformations among themselves; and a theory is then given of single-valued functions of this kind. The author speaks of a Riemann's manifold, instead of a Riemann's surface, and considers a closed two-dimensional manifold instead of a closed surface, and, upon this manifold, single-valued definite differential expressions, instead of simply the element of length. Numerous references are given to the earlier literature of the subject, in which the investigations of Poincaré stand out most prominently. The present memoir, taken with the previous one above referred to, constitutes one of the most important additions that has ever been made to Riemann's theory of functions. — (*Math. annalen*, xxi.) T. C. [413]

Functions of two variables.—M. Poincaré gives a generalization of a theorem of Weierstrass concerning functions of one variable. The theorem in question is, "If $F(x)$ is a meromorphic function over the entire plane, it can be placed in the form of a quotient of two integral functions." M. Poincaré seeks to find the analogous theorem in the case of two variables, and considers a function, $F(X, Y)$, of two imaginary variables ($X = x + iy$, $Y = z + it$). Calling u the real part of a function of X and Y , it is seen that u satisfies a differential equation ($\Delta u = 0$) where

$$\Delta = \frac{d^2}{dx^2} + \frac{d^2}{dy^2} + \frac{d^2}{dz^2} + \frac{d^2}{dt^2};$$

u also satisfies certain other partial differential equations of the second order, which need not be written down. Any function satisfying the equation $\Delta u = 0$ is called a potential function. The aggregate of points satisfying the inequality

$$(x - x_0)^2 + (y - y_0)^2 + (z - z_0)^2 + (t - t_0)^2 < r^2$$

is called a hyperspheric region. The author constructs an infinite number of hyperspheric regions, and considers a point $(xyzt)$ as belonging to at least one of these regions, and being common to not more than five of them. The final theorem obtained is as follows: if Y is any non-uniform function of X , — which has no essential singular points at a finite distance, and which cannot, for the same value of X , take an infinite number of values infinitely near to each other, — it can be considered as the solution of an equation, $G(X, Y) = 0$, where G is an integral function. — (*Comptes rendus*, Jan. 22.) T. C. [414]

PHYSICS.

Mechanics.

Motion of a pendulum.—M. Lipschitz, in a letter to M. Hermite, investigates the motion of a heavy body capable of turning freely about a horizontal axis.

Let M be the mass of body; N , moment of inertia about the axis; Z , distance of centre of gravity of body from the axis; g , acceleration of gravity; θ , angle of rotation, which is 0 when body is at rest. The motion is considered, first, under the condition that the angular velocity vanishes for the value θ_0 of θ , and, secondly, under the condition that the angular velocity vanishes for the value $\pi - \theta_0$ of θ . If t and t' denote the times in these two cases, then

$$\frac{1}{2} N \left(\frac{d\theta}{dt} \right)^2 = Z M g (\cos \theta - \cos \theta_0),$$

$$\frac{1}{2} N \left(\frac{d\theta}{dt'} \right)^2 = Z M g (\cos \theta + \cos \theta_0).$$

M. Lipschitz expresses t and t' in terms of elliptic integrals of the first species, and proceeds to find the corresponding integrals (w and w') of the second species. He points out that these represent quantities to which Hamilton gave the name *accumulated living force*; that is to say, in each case the element of the integral is equal to the sum of the living forces of the system multiplied by the element of time. He shows that if T and T' , W and W' , denote the values of t and t' , w and w' , corresponding to the passage of the body from the state of rest (when θ equal 0) to the state when θ is a maximum (which is θ_0 in the first case, and $\pi - \theta_0$ in the second case), then

$$T W' + W T' = 2 \pi N.$$

Whence it appears that this expression, involving the four quantities T , T' , W , W' , for the two assumed conditions of motion of the same body, has a value depending solely upon the moment of inertia of the body. — (*Comptes rendus*, Dec. 4, 1882.) G. A. H. [415]

Changes in the teaching of mechanics.—M. Yvon Villarceau observes, that what is usually and vaguely termed 'rational mechanics' might with more propriety be called 'general mechanics,' following the example of M. Resal. The science, in M. Villarceau's method of treating it, is based on two principles,—the equation of the motion of a material point projected upon a fixed arbitrary line, and the principle of action and re-action. In treating problems which involve the *liaisons* of points, a certain rule, often neglected, should always be observed. This rule consists in determining the values of all the forces which are eliminated in effecting the solution of the problem, so that we may know whether they are compatible with the properties of the matter of which the bodies are composed; e.g., the intensities of the forces ought not to exceed the limits of the resistance, strings ought not to be subject to a compression, etc. From failure to observe this rule, contradictory results may be reached in the case of certain problems; although all the theorems employed in the solution are incontestably true. As an illustration, M. Villarceau considers the motion of a solid of revolution turning about its axis of symmetry, and left to itself. He is led to the conclusion that the study of the motion of a geometrical solid left to itself ought to be excluded from general mechanics. — (*Comptes rendus*, Dec. 26, 1882.) G. A. H. [416]

(Photography.)

Quantitative photographic measurements.—In connection with the above article a paper was read by Mr. W. H. Pickering, describing some experiments on the absolute sensitiveness, and other important characteristics, of photographic dry plates. As a standard of sensitiveness, ordinary white filter-paper, which is salted and sensitized in standard solutions, was selected. No toning or fixing is employed after the exposure; and the amount of light

absorbed by the exposed portions is measured by a photometer by gaslight. The paper and the plates to be compared are exposed altogether to the direct light of the sky, shining through diaphragms. The plates are then placed in a standard developer for a given time, and fixed. They are next measured by the photometer, and the per cent of light absorbed by the exposed portions determined. The amount of light necessary to darken the paper and each plate 50 per cent is calculated; and the reciprocals of the ratios of these amounts then give the absolute sensitiveness of each plate in terms of the paper taken as a standard. This sensitiveness was found to vary between one and ten million for the various plates measured. It was shown that the plates most sensitive to faint lights were by no means necessarily the most sensitive to high ones, and that those most fogged by gaslight were not proportionately so when exposed to the light of the sky. It was found, that if we expose one portion of a plate to a standard light for a standard time, and then expose another portion to n times the light for an n th time, the same result will be obtained. The largest value of n employed was 500; but, if the law holds for all values, it can be shown that an average plate exposed to direct sunlight will be darkened perceptibly by an exposure of $\frac{1}{100,000,000}$ part of a second. The relative sensitiveness of the paper and plates may perhaps best be illustrated by the fact that to take a photograph of a landscape under ordinary conditions requires an exposure of about five seconds. Now, to take the landscape under the same conditions on sensitive paper directly would require an exposure of a little over one year of continuous sunlight, day and night. Measurements were made of the amount of contrast obtainable by the different plates, and also of the range of light through which they would give gradations of shading. Great differences were found to exist in them, and several peculiarities in the development of the plates measured were noted. — (*Amer. acad. arts. sc. ; meeting* Feb. 14.) [417]

Bicarbonate-of-soda developer.—A developer very popular in Europe at present is that recommended by Mr. John McKean,—a cold saturated solution of bicarbonate of soda, 1 ounce; liquid ammonia (.880), 1 ounce; water, 4 ounces.

A few drops of the above in a three-grain solution of pyro. will develop any good plate with less exposure, and with more detail in the shadows, than has ever yet been secured with the use of bromide. If the shadows are not as clear as may be desired, increase the proportion of bicarbonate. One or two drops of nitric acid in the hypo. solution dispel any trace of fog that may exist after a forced development, in the case of under-exposure. — (*Phot. times*, Jan.) W. H. P. [418]

Carbonate-of-soda developer.—A very popular recent American developer is that given by Mr. H. J. Newton. Stock solution No. 1: carbonate of soda, 500 grains; water, 10 ounces. Stock solution No. 2: pyrogallallic acid, 20 grains; oxalic acid, 30 grains; water, 10 ounces.

Take equal parts of the above solutions, thoroughly mixed, and flow over the exposed plate, which has first been laid in water for a minute or two. If the plate should be over-exposed, add a few grains of bromide of ammonia; if under-exposed, use a stronger solution of soda. Instead of oxalic, we may use glacial phosphoric acid (1½ grains to the ounce) or concentrated formic acid (4 grains to the ounce). These acids give rather better colored images than the oxalic, but, even in large cities, are sometimes difficult to obtain. — (*Phot. times*, Feb.) W. H. P. [419]

Electricity.

Rotatory effect of terrestrial magnetism.—In 1878 H. Becquerel showed that the rotatory influence of terrestrial magnetism on light traversing gases could be accurately measured. The fundamental experiment consists in arranging upon the same horizontal support, movable about a vertical axis, a source of light, a polarizer, a column of the substance to be investigated, and an analyzer mounted upon a divided circle. The axis of the column and of the beam of light is placed in the magnetic meridian, and the plane of polarization noted: the apparatus is then turned end for end; the plane of polarization is still the same, but the divided circle has been turned about, so that the apparent rotation is reversed. The effect was multiplied by successive reflection from mirrors at the end of the column of gas, and also by interposing a thin crystalline plate, which rotated the plane of polarization symmetrically about the axis of the crystal.

The author found that the plane of polarization of the luminous rays, D, is rotated through .0435° in traversing 1 metre of CS₂ at 0° C. under the influence of terrestrial magnetism, and that between two points 1 cm. distant, in a magnetic field of strength unity (C. G. S.), the rotation of the same rays in passing through CS₂ at 0° C. is .0463 ± .0004. Thus he claims he can measure, by an optical determination, the intensity of any magnetic field whatever to 1/100 of its value. — (*Ann. chim. phys.*, Nov., 1882.) J. T. [420]

Electric discharge in rarefied air.—Edlund continues his investigation of this subject. He connects the combs of a Holtz machine by means of a wire interrupted by a short air-space. The circuit contains in multiple arc a sensitive galvanometer, and a rarefied-air space, 5 mm. long, between aluminium electrodes. The galvanometer is also shunted by a wire; and one junction of this shunt with the rest of the circuit is grounded. When the Holtz machine is worked, frequent sparks pass, and the galvanometer-needle finally attains a nearly constant deflection. The singular fact is observed, that this deflection is many times greater, when the galvanometer is shunted by the rarefied-air space, than when it is not so shunted. The explanation proposed is, that, after each spark from the Holtz machine passes through the rarefied-air space, a 'disjunction,' or reverse current, is set up by the e. m. f., which the discharge has generated at the surface of the electrodes. This current passes through the galvanometer in the same direction as the current from the machine.

Edlund's articles seem to be of value in calling particular attention to the long-recognized resistance at the surface of the electrodes in a discharge-tube, thus making it appear probable that the proper resistance of rarefied air has been overestimated, and so tending to remove the difficulty at present felt in regard to the height of auroras. Edlund's own conclusion—viz., that empty space, or rather the ether, is an excellent conductor—will probably be accepted by few. — (*Phil. mag.*, Jan.) E. H. H. [421]

ENGINEERING.

The Corinth canal.—As early as the year 625 B.C., the idea of connecting the gulfs of Corinth and Aegina by means of a canal was conceived. It was abandoned after some discussion, from the belief that the level of the sea in the gulf of Corinth was higher than that in the gulf of Athens. Later, Julius Caesar, Caligula, and Nero employed engineers to plan this work; but little was actually accomplished. Quite recently Gen. Türr obtained a concession from

the Hellenic government to cut a canal across the isthmus, of dimensions sufficient to pass one vessel at a time; the cross-section being the same as that of the Suez Canal, i.e., 72 feet wide at the bottom, and with a depth of 26 feet. Three several routes were surveyed, being respectively 3.94 miles, 4.2 miles, and 6.8 miles in length. The first of these lines was selected, being the same as that proposed by Nero's engineers. The work was commenced last May, the estimated cost being thirty million francs. It is believed that the investment will be a good one, as the traffic across the isthmus is now from five to six million tons annually. — (*Engineering*, Dec. 8, 1882.) G. L. V. [422]

The Kinzua viaduct.—This remarkable structure carries a branch of the New-York, Lake-Erie, and Western railroad, over a deep gorge in western Pennsylvania, the Kinzua Creek. This is the highest railroad-bridge in the world, the distance of the rails above the stream being 301 feet, while the whole length of the work is 2,052 feet. The structure is designed to sustain a continuous line of the heaviest locomotive engines from one end to the other, or 2,660 tons in all. The original conception of a viaduct at this place is due to Mr. O. W. Barnes, C. E. The execution has been made under the general direction of Mr. O. Chanute; the details being arranged and the construction carried out by Messrs. Clarke, Reeves, and Co. of Philadelphia. The total cost of this enormous structure was but \$237,000, and the time occupied in building was only 94 days. The towers were erected without scaffolding of any kind, while the superstructure was placed in position by means of a travelling crane; a method which secured economy of both time and money. Especial care has been taken to enable the structure to resist the severest gales of wind. Ample provision, too, has been made for the effect of heat and cold upon the iron-work. — (*Engineering*, Dec. 22, 29, 1882.) G. L. V. [423]

Centrifugal pumps.—The common objection to this kind of pump is, that it wastes a large percentage of the power applied; but G. Kapp of London maintains, that, if the pump is rightly made and rightly worked, it will utilize as large a percentage of the applied work as any hydraulic machine. He gives the mathematical theory of the centrifugal pump, shows how to find the loss through friction, investigates the best form for the wheel-blades, and lays down general rules for the construction throughout. — (*Civilingenieur*, heft 4, 1882.) G. A. H. [424]

CHEMISTRY.

(General, physical, and inorganic.)

Formation of natural manganese binoxide, and certain reactions of other peroxides.—From the results of M. Berthelot, it seems that the heat of formation of Mn O₂ in the reaction Mn O + O = Mn O₂ is larger by 3.9 cal. than that of Mn CO₃ in the reaction CO₂ (in solution) + Mn O = Mn CO₃. An explanation is thus found for the formation of the mineral pyrolusite by the action of air, either free, or dissolved in water. In the reactions 2 Fe O + O = Fe₂O₃ + 13.3 cal. for Fe O; 3 Fe O + O = Fe₃O₄ + 10.3 cal. for Fe O; CO₂ (in solution) + Fe O = Fe CO₃ + 5 cal. (or, CO₂ (gaseous) + 7.8 cal.),—more heat is evolved in the formation of the oxide than of the carbonate. The stability of Ba CO₃ is shown in the reactions Ba + O = Ba O, + 6 cal.; Ba O + CO₂ = Ba CO₃ + 28 cal. Hydrogen peroxide cannot be formed from Mn O₂, since there would be an absorption of heat: Mn O₂ + H Cl = Mn Cl₂ + H₂O₂, -9.7 cal. It cannot be formed from ferric oxide, since the quantity of heat absorbed would equal -16 cal. With

barium peroxide, heat is evolved: $\text{BaO}_2 + 2\text{HCl} = \text{BaCl}_2 + \text{H}_2\text{O}_2$, + 11 cal. — (*Comptes rendus*, xvi. 88.) C. F. M. [425]

Electric conductivity of silver chloride, bromide, and iodide. — W. Kohlrausch finds that silver salts of the halogens offer less resistance to an electric current than sulphuric acid. In the order of their conducting-power, the chloride stands first, the iodide last, and the bromide occupies an intermediary position. — (*Ann. chim. phys.*, xxvii. 612.) C. F. M. [426]

Antiseptic character of carbonic-dioxide gas. — In an atmosphere of this gas, H. Kolbe finds that the quality of fresh beef can be preserved for several weeks, even in a warm room. Fish, game, mutton, and veal begin to decay after a few days. — (*Journ. Prakt. chem.*, n.f. xli. 249.) C. F. M. [427]

Investigations on uranium. — For the atomic weight of uranium, the values 120, 180, and 240 have been proposed, the latter appearing in Mendeleeff's classification. In order to decide which of these values is correct, C. Zimmermann determined the vapor density of the tetrabromide and tetrachloride, and the specific gravity and specific heat of the metal. Vapor density of the tetrabromide obtained, 19.46; calculated for UBr_4 ($\text{U} = 240$), 19.36; of the tetrachloride obtained, 13.3; calculated for UCl_4 ($\text{U} = 240$), 13.21. The metal was prepared by ignition of a mixture of the chloride with sodium covered with salt. Specific gravity, 18.7; atomic volume, 12.84; specific heat of the melted metal, 0.02765. This value multiplied by the atomic weight (240) gives, as the atomic heat, 6.64; the law of Dulong and Petit requiring 6.64. Uranium must therefore occupy a position in the sixth group of the periodic system with chromium, molybdenum, and tungsten. — (*Ann. der chem.*, 216. 1.) C. F. M. [428]

Heat of formation of volatile organic bodies. — The heat of formation of such compounds as carbon tetrachloride, chloroform, and perchlorethylen has not been determined, on account of the great difficulty of obtaining complete combustion. In the combustion of compounds of chlorine and carbon containing a small percentage of hydrogen, Julius Thomsen obtains accurate results by burning the volatile substance, mixed with hydrogen, in a special form of apparatus, which he has devised for this purpose. Thomsen concludes from his results, that carbon possesses an equally strong affinity for hydrogen and chlorine. The heat of formation of ethylen and perchlorethylen are nearly the same; and, assuming 14,130 cal. as the most probable value of the double bond between the carbon atoms, the affinity of a hydrogen atom for carbon would be 15,080 cal., and that of a chlorine atom, 14,330 cal. — (*Berichte deutsch. chem. gesellsch.*, xv. 2096.) C. F. M. [429]

Constitution of carbonic acid. — Since a solution of carbonic dioxide in water dissolves magnesium with evolution of hydrogen, M. Ballo concludes that it contains the hydrated acid H_2CO_3 . As a further proof, he mentions the fact that potassium and sodium bicarbonates dissolve magnesium, forming the carbonate $\text{MgCO}_3 \cdot 3\text{H}_2\text{O}$. The formation of magnesium sulphite, by the action of SO_2 in solution upon the metal, indicates the hydrated acid H_2SO_3 . — (*Berichte deutsch. chem. gesellsch.*, xv. 3003.) C. F. M. [430]

MINERALOGY.

Jade. — Two specimens, — one from the Karakash valley, southern Turkistan, from a mine formerly worked by the Chinese; the other from New Zealand, — upon analysis, gave C. L. Allen results agreeing with amphibole. — (*Chem. news*, xli. 216.) S. L. P. [431]

Cryolite. — A review of the history of the fluorine minerals, especially those occurring with cryolite from Greenland, is given by P. Groth along with results of renewed crystallographic and chemical investigation. Crystals of cryolite, after having been identified and measured, were given over for chemical analysis to J. Brandl, whose results agreed very closely with the composition expressed by the formula $3\text{NaF} \cdot \text{AlF}_3$. The results of the renewed crystallographic measurements prove the mineral to be monoclinic with the axial relation $a:b:c = 0.9662:1:1.3882$. $\beta = 89^\circ 49'$. The optical department of the mineral also indicates its monoclinic character. — (*Zeitschr. krypt.*, vii. 375.) S. L. P. [432]

Hörnesite. — Accompanying nagygite from Nagyg, M. E. Bertrand has identified crystals of a pale rose color, very soft, and easily cleavable in one direction, which, upon chemical examination, proved to be a hydrated arseniate of magnesia containing a little calcium and manganese. The mineral is supposed to be identical with the hörnesite described by Haidinger. — (*Bull. soc. min.*, v. 306.) S. L. P. [433]

PHYSICAL GEOGRAPHY.

Former great tides. — Prof. R. S. Ball, in a second lecture on this question, reviews the criticisms of his previous statements, and repeats his belief that the accumulation of the oldest stratified rocks was very probably aided by this newly discovered and very important agent; namely, the stronger tides produced by the moon when not so far from the earth as it now is. — (*Nature*, Dec. 28, 1882.) W. M. D. [434]

Gulf-Stream. — Commander Bartlett's recent measures on the coast-survey steamer Blake show that the current off Florida, where the channel is 48 miles wide, and the deepest point 439 fathoms, has a cross-section of 429,526,240 \square feet; a velocity from one to five, averaging three miles an hour; a discharge of 51,000,000,000,000 gallons an hour; and a temperature varying from 78° to 83° at the surface, and from 57° to 44° at the bottom. Farther along our coast, the current flows over an even plateau, narrowing toward Cape Hatteras, about 400 fathoms deep, and suddenly dropping off to over 2,000 fathoms at its eastern edge. In the stronger parts of the stream, the bottom is swept clean, and consists of firm coral rock, hard enough to dent the brass cylinder of the sounding-apparatus. Where fine deposits occur, south of Charleston, they are of pteropod ooze, characteristic of the Caribbean and Gulf of Mexico; farther north, globigerina ooze becomes more common, as it is in the open north Atlantic. The division between these two deposits is considered the boundary of the cold, arctic current which follows down our shore from the north, passing under the Gulf-Stream off Hatteras, where the shallow plateau forces it out. No warm and cold bands or bifurcations were found in the surface-waters till off Hatteras, and no distinct 'cold wall.' Near shore the current was much influenced by winds. A brief description is given of the Siemens deep-sea thermometer, based on the variation of electrical resistance in metals with change of temperature. Measures made with this and with the Miller-Casella thermometer show almost absolute agreement, even at considerable depths. — (*Bull. Amer. geogr. soc.*, 1882, 69. Further account of Bartlett's work may be found in *Proc. U. S. naval inst.*, vii. 1881, 25; viii. 1882, 221.) W. M. D. [435]

GEOGRAPHY.

(Europe.)

French census of 1881. — After deducting the number of foreigners temporarily resident in France,

estimated at about 1,000,000, Chervin finds that the population increased with extreme slowness, or even remained stationary, when compared with the enumerations of 1872 and 1876. Departments showing an increase have grown by immigration. Decrease of population is found even in some of the rich and well situated departments, as parts of Normandy; and the same districts show a large percentage (40 or 50) of rejections from the conscripts for recruiting the army. Both these marks of a lack of healthy growth are ascribed to the effects of drunkenness, which is unfortunately prevalent in some of the communes of this region. — (*Comptes rendus soc. géogr. Paris*, 1883, 40.) W. M. D. [436]

Geographic work in Spain.—According to a summary by Ferreiro, the geographical and statistical institute of Spain have the past year determined the force of gravity at Madrid, and the latitude and longitude (telegraphic) of Madrid and Bajadoz. The difference of level between the Atlantic and Mediterranean is found to be +0.6625 metre: for more accurate determination of this in the future, automatic temperature, pressure, and wind registers have been established at Alicante, Santander, and Cadiz. — (*Bol. soc. geog. Madrid*, xiii., 1882, 317.) W. M. D. [437]

(Atlantic Ocean.)

Cape Verde Islands.—This seldom-visited group was examined by Dr. C. Doelter of Graz in the autumn of 1880. The islands do not consist exclusively of volcanic rocks, but contain also gneiss, mica and clay slates, and limestones, lending support to the view that they make part of a continental mass once of considerable extent. Their former direct connection with the mainland is, however, questionable, as the opposite shore of Africa does not contain similar formations in their latitude. (A connection would seem more probable north-eastward to the Atlas range.) Doelter's geological results are given in *Die vulkane der Kapverden und ihre produkte* (Graz, 1882). This is to be followed by a general narrative including his journey to western Africa, with the title *Nach den Kapverden und dem Rio Grande* (Leipzig, Froberg). — (*Peterm. mitth.*, 1883, 72.) W. M. D. [438]

Atlantic Soundings.—The brothers Siemens have established a broad reputation by their technical as well as scientific work, ranging from their copper-works in the Caucasus to the construction of cables and telegraph-lines through oceans and wildernesses, as well as to practical researches in electricity. It has not, however, been generally known, that, since 1874, they have undertaken deep soundings in the North Atlantic from one of their own vessels, in connection with their work of cable-laying. Their results have lately been published (Stanford, London) in three charts, giving a valuable addition to our knowledge of the relief of the sea-floor in the cable-zone between Ireland and Newfoundland. The soundings were made with Sir William Thomson's steel wire apparatus, and, by repeated measures in the same place, are found accurate within a few fathoms, even in depths of two miles. The charts are of limited areas; one including the 'Faraday Hills,' N. lat. 49° 20' to 50°, W. long. 28° 30' to 30° 15'; the other two, in the region of the Vliam cape, east of the Newfoundland banks. — (*Peterm. mitth.*, 1883, 39.) W. M. D. [439]

The 'Travailleur's' cruise in 1882.—Lieutenant Parfait reports that the *Travailleur* spent July and August of last summer in following near the coast of Spain and Morocco as far as the Canaries, and

back by Madeira to Lisbon and Rochefort. The weather was much worse than was expected; but 71 dredgings were made in depths from 50 to 1,800 fathoms. The 100-fathom plateau was found along the northern coast of Spain, with a width of about twenty miles; beyond its border the depths were very variable, as had been the case in the previous cruises. With this rapid change of depth, the character of the bottom changed also, and the fauna was local. Off Morocco, the bottom was more even, and was covered with a soft reddish mud; the fauna was new and interesting. Among the Canary islands the depths were variable; the bottom was almost barren of life, and was strewn with volcanic dust and ashes. By Madeira, the dredge was often brought up torn by the corals on the bottom. — (*Comptes rendus, soc. géogr. Paris*, 1883, 55, map.) [An account of the outfit and previous soundings of the *Travailleur* is given by Milne-Edwards (*Bull. soc. géogr.*, 1882, 93.)] W. M. D. [440]

BOTANY.

Cryptogams.

Marine algae of Germany and Austria.—The first three parts of the second volume of Rabenhorst's *Kryptogamen-flora* contain an account of the marine algae of Germany and Austria by Hauck, illustrated with numerous and excellent woodcuts, showing the structure of the fronds and fruit of the different genera, and three full-page photolithographs of species of Corallineae. The parts already published include the lower orders of Florideae, from Porphyraceae to Cryptonemiaceae. The descriptions are clear and full, and the synonymy carefully arranged; and the work will be of great value to American algologists, as it gives the best comprehensive account of the European genera of red seaweeds, the greater part of which have representatives on our own coast. — W. G. F. [441]

Reproduction in Saprolegniaceae.—The *Botanische zeitung* contains a reply of DeBary to the remarks of Pringsheim in the Berlin *Monatsbericht*, in which he questioned the accuracy of some of DeBary's statements in his work, *Beiträge zur morphologie der pilze*, heft 4. DeBary regarded those forms in which ripe spores were produced in oogonia without the intervention of pollinodia (which, in most of the species, make their way into the oogonia) as instances of apogamy, and considered that the forms in question were originally derived from some form having proper pollinodia, but had gradually lost their sexuality. Even in the species of *Achlya* in which pollinodia are present, DeBary failed to see any direct communication between the contents of the oogonia and pollinodia. Pringsheim, on the other hand, describes bodies which he calls spermamoebs, which are contractile masses of protoplasm formed in the pollinodia, and which may be discharged through the walls of the pollinodia without any apparent opening, and unite at once with the oospheres when the pollinodia are in the oogonium; or, in case they do not reach the oogonia, as in some species of *Achlya*, the spermamoebs are discharged into the water, and then make their way into the oogonia. In the *Botanisches centralblatt*, Zopf maintains that Pringsheim's spermamoebs are amoeboid parasites. DeBary believes that, even on the supposition that the spermamoebs are not parasites, there are species of *Achlya* and *Saprolegnia* in which sexuality is entirely wanting, and that one cannot assume, as Pringsheim has done, that, in the forms in which the oospheres are produced without any apparent formation of pol-

linodia, a fertilization is accomplished by means of spermamoebae produced from antheridia remote from the oogonia. DeBary again shows that it is not true, as Pringsheim maintains, that the spores produced, as he calls them apogamously, differ from others in the duration of their resting-period. — (*Bot. zeit.*, Jan., 1883.) — W. G. P. [442]

Phenogams.

Leafy berries in *Mitchella repens*. — Monstrous fruits of partridge-berry, from the valley of Cayuga lake, have been studied with attention by Prof. Dudley, who gives several good figures of the malformations. The following statement shows that the cases possess more than ordinary interest: "The true peduncle has entirely disappeared; and those parts of the petioles coming in direct contact with the berry have become part of it, and have readily assumed its color, texture, and general aspect. But this union has not interfered with the fruitfulness or development of the ovary; the seeds being present, and the size of the berry not being under the average." — (*Torrey bot. bull.*, Jan., 1883.) G. L. G. [443]

Fertilization of *Asclepias cornuti*. — The structure and development of the asclepiad flower have been restudied by Mr. T. H. Corry, who stated the result of his work before the Linnean society Dec. 21, 1882. Self-fertilization, with the parts *in situ*, is believed to be impossible. — (*Nature*, Jan. 11, 1883.) W. T. [444]

Dichogamy of *Pelargonium*. — Professor Barnes points out the protandry of the lemon-scented geranium, *P. graveolens* (*Botan. gazette*, Jan., 1883). In this respect the genus is a very homogeneous one. — W. T. [445]

Pollination of *Arum italicum*. — Dr. Kraus, who has recently studied at Rome the rise of temperature observable in the spathe of this aroid, finds that the maximum is reached between four and six P.M., when it may exceed the temperature of the surrounding air by 27.7° C. At this time the stigmas of the pistillate flowers are receptive, and the spathe opens to allow the entrance of small diptera, which are attracted by the warmth and shelter offered. If they have previously escaped from older spathes, they bring pollen to fertilize the mature pistils. Their escape is prevented by a whorl of rudimentary stamens, as in *A. maculatum* and some spathes of *Arisaema triphyllum*. The temperature gradually falls until morning, when each stigma, having wilted, emits a drop of nectar that is greedily eaten by the flies. The stamens now dehisce, and the insects, pollen-laden, escape to visit other young spathes later in the day. — (*Abhandl. naturf. gesellsch. Halle*, xvi.; fide *Kosmos*, Dec. 30.) W. T. [446]

ZOOLOGY.

Polyps.

Operculate corals. — G. Lindström has just issued an important memoir on the operculiferous corals of the paleozoic formations, illustrated with nine fine plates. He divides them into two groups, — Calceolidae and Araeopomatidae; the former containing Calceola, Rhizophyllum, and the recently described Platyphyllum Lindström (upper Silurian of China), — all with opercula of a single valve, — and Gonio-phyllum, with an opercular apparatus of four pieces. None of the species are new; though Platyphyllum sinense has barely entered into paleontological literature in the fourth volume of Richthofen's 'China.' The second family contains the new genera Areopoma and Rhytidophyllum; the former proposed for Cystiphyllum prismaticum Lindström (1868), from

the Silurian of Gotland, and the latter for *R. pusillum*, a new species from the same formation. A broken operculum from Lerberget, not named, is believed by the author to represent a new genus of the same family. Remarks follow on Pholidophyllum and Syringophyllum. Chelodes Dav. & King, a very problematical genus, is referred to as probably Chit-onoid. The text (ninety-four pages) is in Swedish. Twenty-one species are illustrated. — (*Stensk. vet. akad. handl.*, vii. lv., 1882.) W. H. D. [447]

Mollusks.

European land-shells. — The first supplement to the second edition of Kobelt's catalogue of the European land and fresh-water mollusk-fauna is just published. It is presented in the shape of a systematic catalogue of species, with synonymes, locality of publication, and habitat, for each of the additions, which are very considerable. Most of the real additions are from the Caucasian region, the borders of the western Mediterranean, Italy, and Sardinia, and are due to Boettger, Kobelt, Paulucci, Lessona, and Pollonera. To Locard and Bourguignat we are indebted for an extraordinary number of new names, applied to variations and varieties of well-known species. The amount and character of the current literature of this topic may be imagined from the fact that this supplement contains about twenty pages of new names supposed to be valid, and five pages of pure synonymes.

In the same issue appears an article by H. Tschapeck, on the varieties of *Clausilia dubia* found in Steiermark. — (*Nachr. blatt. malac. ges.*, 1883.) W. H. D. [448]

Shells from the Colorado region. — Mr. Stearns has recently received from Indio, Colorado desert, a most interesting lot of Physae, collected by Prof. George Davidson. They intergrade perfectly with one another, connecting *P. humerosa* with *P. heterostropha*, and these with *P. virgata*, etc. Recent data also carry the distribution of *Anodonta californiensis* two hundred and fifty miles east of the main stream of the Colorado river. — W. H. D. [449]

Variations of *Pompholyx*. — A calcareous deposit occurs in Pyramid lake, Nevada, consisting chiefly of incrustated pine-needles and shells of *Pompholyx efusa*. These last vary widely from the original type, showing all grades of costation from perfectly smooth to strongly costate, as in *Vorticifex*; these being the form named *costata* by Hemphill. Others show decided inclination to become umbilicated, thus verging toward *Carinifex* and its allies. — W. H. D. [450]

Worms.

A cave-dwelling Planarian. — Under the provisional name of *Vortex cavicolens*, Dr. A. S. Packard, jun., describes a Turbellarian from X cave of the Carter caves, Kentucky. The animal is white, about four millimetres in length, and in the alcoholic specimen no eyes could be observed. There is but a single genital outlet near the posterior extremity. — (*Amer. nat.*, xvii. 89.) C. S. M. [451]

***Hamingia artica*, a rare gephyrean.** — This rare worm was known only from three specimens. Lankester has now had an opportunity of examining two others, one of which he dredged himself last summer at forty fathoms, on a rocky bottom off Ler-vik. Lankester's specimen had a proboscis, or frontal hood, which he supposes to have been broken off in Koren and Danielssen's original specimen, as they consider its absence characteristic. In the liquid of the body-cavity exist corpuscles impregnated with

haemaglobin. Lankester's second specimen had only one genital papilla and orifice, instead of two, and contained five males, which live, as in *Bonellia*, as minute parasites on the female. The male is provided with a pair of large genital setae, although such are wanting in the female. — (*Ann. mag. nat. hist.*, xi. 37.) C. S. M. [452]

Myriapoda and arachnids.

The blastopore and mesoblast of Peripatus. — The late Prof. Balfour was engaged, just before his death, upon a monograph on the anatomy and development of *Peripatus*, and left a series of notes, completed manuscripts, and drawings, which it is intended to publish in the Quarterly journal of microscopical science for April next. Some of the results have been presented as a preliminary note to the Royal society of London.

The results are briefly as follows: that a widely-open slit-like blastopore is formed in the early oval embryo. The blastopore, which occupies the median ventral line, becomes closed in its centre, an anterior portion remaining open as a mouth, while a posterior portion apparently becomes the anus. The mesoblast is formed from the entoderm at the lips of the blastopore, and makes its appearance as a series of paired hollow outgrowths from the cavity of the archenteron. — (*Journ. microsc. soc. Lond.*, Feb., 1883, 52.) C. S. M. [453]

Eyes of Scorpio and Limulus. — E. Ray Lankester and A. G. Bourne have investigated the minute structure of the eyes in *Limulus* and *Scorpio*, and conclude that the results, which are given in detail and with elaborate illustrations, confirm the opinion previously expressed by Lankester, that the scorpions and king-crabs are closely allied representatives of the class Arachnida. The compound lateral eyes of *Limulus* are compared with the lateral groups of simple eyes in scorpions, and found to agree in the most essential points. The central eyes of *Limulus* are found to agree still more closely with those of scorpions. — (*Quart. journ. microsc. sc.*, Jan., 1883.) S. I. S. [454]

Insects.

The scales of Coleoptera. — Mr. George Dimmock described the scales, or scale-like hairs, of a number of beetles, and considered the effects of scales on the coloration of these insects, and the modes of coloration of scales themselves. Scale-like hairs of *Cicindela*, *Psiloptera*, *Anthrenus*, *Hoplia*, *Polyphylla*, *Valgus*, *Chalcolepidius*, *Alaus*, an undetermined genus of European *Elatridae*, *Ptinus*, *Clytus*, and *Entimus*, were described. This adds the *Elatridae* and *Cerambycidae* to the families which were already recorded as sometimes owing their figuration to a scale-covering. The influence of air in producing silvery and milky whiteness in insects and in their scales was also discussed. The author adopted Dr. H. A. Hagen's division of the colors of insects into 'optical' and 'natural' colors of two sorts, — 'dermal' and 'hypodermal,' — and gave a table of treatment with reagents, to enable one to distinguish these colors in scales under the microscope. As far as examined, scales of *Lepidoptera* owed their coloration to optical and hypodermal colors; scales of *Coleoptera*, to optical and dermal colors; although too much stress must not be put upon the differences between dermal and hypodermal colors. The paper, which will appear in full in *Psyche*, was illustrated by numerous figures and microscopic preparations. In conclusion, a mode of collecting together scales, or other minute objects of similar nature, on a microscope slide, was exhibited.

This consists in putting the scales in a drop of some quickly evaporating substance — chloroform is best for most purposes — on the slide. The scales will form in a kind of whirlpool, nearly all the scales finally settling down, as the liquid evaporates, in one place on the slide. This mode of operating is very convenient; and, by inclining the slide gently, the mass of floating scales can be made to settle on the exact centre of the glass. One part of Canada balsam to several hundred of chloroform will cause them to stick to the slide. — (*Cambr. ent. club; meeting* March 9.) [455]

Mimicry of humming-birds by moths. — The striking resemblance in size, form, and movements, of the South-American *Macroglossa Titan* to humming-birds, which has been noticed by Bates, Fritz Müller, and others, and referred to the similarity in their habits, is believed by Dr. Krause to be a case of protective mimicry; the moths benefiting by their resemblance to the birds, which have few winged enemies. The closeness of the resemblance is supposed also to protect the moths from the humming-birds, which always give chase when they recognize them. To do away with an objection that might be urged from the similar appearance of European *Macroglossae*, which have no *Trochilidae* to imitate, it is assumed either that these birds occurred in Europe in late tertiary times, or that the moths are recent importations from the new world. — (*Kosmos*, Nov.) W. T. [456]

(Economic entomology.)

The regulative action of birds upon insect oscillations. — The question "Do birds sometimes vary their diet so far as to neglect their more usual food, and take extraordinary numbers of those species of insects, which, for any reason, become superabundant for a time?" is answered by Prof. Forbes in a very conclusive manner. He selected an orchard which had been for some years badly infested by canker-worms; shot a considerable number of birds therein for two successive years (54 birds of 24 species the first year, and 92 birds of 31 species the second year), representing nearly all the kinds seen in the orchard; made full notes of the relative abundance of the species; examined carefully the contents of the stomachs obtained, with reference not only to the presence of canker-worms, but of all other insects as well; and tabulated the results. The summaries on these tables are brought into comparison with those derived from birds of the same species shot in ordinary situations during the same month. Thirty-six species of birds were taken in the infested orchard. 72% of the species, and 60% of the specimens, had eaten canker-worms. 33% of all the food eaten by all the birds was canker-worms. The comparisons made between the food of these birds and that of birds shot in other situations show, that the large proportion of the food which the canker-worms constituted, in one case was compensated by a general diminution of the ratios of all the other kinds of food, and not by a neglect of one or two alone. Hence the birds, in checking the increase of the canker-worm, were not tending to allow an undue increase of any other species of insect. — (*Bull. Ill. state lab.*, No. 6, Dec., 1882.) J. H. C. [457]

Corn-root worm. — The eggs of *Diabrotica longicornis* have been discovered by Prof. Forbes. They are laid in September and October in the ground upon or about the roots of corn, and probably do not hatch until the following May or June. The best means of checking the increase of this insect is, therefore, rotation of crops. — (*Prairie farmer*, Dec. 30, 1882.) J. H. C. [458]

VERTEBRATES.

Discovery of the blood-circulation.—From a careful study of the works of Colombo, and a comparison of dates, Tollin concludes that Colombo was not an original discoverer of the pulmonary circulation, but merely appropriated the work of Servetus. — (*Arch. path. anat. phys.*, xci. 1883, 39.) H. N. M. [459]

Internal polarization of nerves.—As the result of experiments carried on in Lovén's laboratory, Tigerstedt concludes, that, when the polarizing current is opened, the polarization instantaneously reaches its highest value, and then continuously decreases. The decrease is at first rapid, then falls more and more slowly; so that polarization still remains long after the opening of the polarizing current, and only asymptotically approaches the zero point. — (*Mittb. physiol. lab. Carol. inst. Stockh.*, i., ii., 1882.) H. N. M. [460]

Action of the intercostal muscles in breathing.—Lukjanow has made fresh observations on this long-disputed subject. In his experiments, rabbits and dogs were used; the breathing of the former being mainly diaphragmatic, that of the latter chiefly costal. On examination of the intercostal spaces, exposed by removing the skin and the pectoral muscles, he found that the changes in their width during inspiration depended on the thoracic region observed. The upper two or three intercostal spaces were narrowed in inspiration; the lower three or four, widened; the intermediate remained unchanged. The phenomena were the same in forced and in quiet breathing, and essentially alike in rabbit and dog, though more conspicuous in the latter animal. Moreover, during artificial respiration, the same changes in the widths of the various intercostal spaces were observed as in normal breathing. The author concludes, that it is most probable that the view of Henke and Brüche is correct, in accordance with which the intercostal muscles have no proper duties as muscles, but simply form an elastic membrane, enclosing the thorax. Very considerable difficulties oppose the acceptance of this view, and these Lukjanow to some extent recognizes. He concludes by stating that the full explanation of the phenomena observed by him cannot be given until all the respiratory movements of the ribs have been separately investigated. — (*Pflüg. arch.*, xxx. 1883, 82.) H. N. M. [461]

Tarsus of birds and dinosaurs.—This paper by Georg Baur forms an important contribution to our knowledge of the resemblances of the tarsus of birds to that of dinosaurs, especially *Compsognathus*. The tarsus of birds as shown by embryos is composed of a tibiale, fibulare, and a piece representing tarsals 1-5; the latter ankylose with met. 2-4, and the two first with the tibia. Contrary to the observations of Prof. E. S. Morse, the ascending process is held to be a rather late product, but an integral part, of the tibiale. By an extended study of the tarsus among the dinosaurs, he finds the following points of resemblance to birds: 1°. That the tibia and fibula become slim in embryo birds in the same way as in the evolution of dinosaurs. 2°. The similar blending of fibulare and tibiale, and the position of the fibulare under the tibia. 3°. The blending of the first row with the tibia in both cases. 4°. The morphological relations of the ascending process: this is small or absent in early dinosaurs, and is slowly evolved. 5°. The resemblance of the development of the metatarsals in birds to the evolution of the same parts in dinosaurs. 6°. The similar decrease in the number of the toes. — (*Morph. Jahrb.*, 1882, 417.) J. A. J. [462]

Permian fishes and reptiles from Texas.—Professor E. D. Cope exhibited some specimens of fishes and reptiles from the Permian formation of Texas. One of these was a new species of *Crossopterygian* fish, which he named *Ectosteorhachis cicronius*. It exhibited some important characters of the posterior cranial region. The base of the skull consists of ossified parachordals; and these embrace the chorda dorsalis posteriorly, and are continued for a short distance posteriorly as a tube. Anteriorly the chordal groove is open. He considered the cranial structure to be an excellent illustration of a permanent embryonic type.

The most interesting reptile was a new genus which occupies a place between the *Pelycosauria* with molar teeth and those with raptorial teeth, but with more resemblance to the former, or *Diadectidae*. The teeth are placed transversely in the jaws, but the crowns terminate in an incurved apex, without ledge. He named the genus *Chilonyx*, and referred it provisionally to the *Bolosauridae*. The typical species is the *Bolosaurus rapidus*,—an animal with a skull as large as that of a terrapin, and with robust limbs. The surface of the skull is divided by grooves into numerous swollen areas; and some of these on the lateral occipital region are developed to tuberosities, like the rudimental horns of *Phrynosoma Douglasi*. — (*Acad. nat. sc. Philad.*; meeting March 6.) [463]

Reptiles.

Dinodipsas, a new venomous snake.—Professor E. D. Cope drew attention to a recent important discovery, made by Prof. Peters of Berlin, of a new genus of venomous snakes, *Dinodipsas*. The speaker stated that he regarded the genus as pertaining to the *Causidae*,—a family he had proposed as a subfamily in his first paper read before the Academy in 1859. As *Causus*, the only genus heretofore known, is African, the statement of Peters, that *Dinodipsas* is South American, adds an important fact to geographical zoölogy. Prof. Cope then corrected a statement made by Peters in his herpetology of the *Reise nach Mozambique*, that he (Prof. Cope) had referred *Causus* to the vipers. In 1859 he had divided the venomous snakes with vertical and hinged maxillary bones into the subdivisions of the rattlesnakes, the vipers, the *Atractaspines*, and the *Causines*. He then designated the entire group *Viperidae*, after Bonaparte, and had not until later used Dumeril and Bibron's terminology. This did not, however, justify Peters in stating that he has referred the genus *Causus* to the vipers, and that he (Peters) was the author of a separate family, the '*Vipernatæ*,' to receive that genus and *Dinodipsas*. — (*Acad. nat. sc. Philad.*; meeting March 5.) [464]

Mammals.

On *Halichoerus gryphus*.—Nehring, basing his remarks upon the result of an examination of a full-grown male gray seal, captured at Goehren, island Rügen, gives some valuable information in regard to the species. The intestines of the Goehren specimen, which measured 38 metres, i.e., 17 times the length of the animal, were filled with partially digested fish-vertebrae, and immense numbers of the nematoid worm, *Ascaris osculata*. A comparison of skulls in the museums of the universities of Greifswald and Berlin shows that great variation exists; making it probable that the three species of *Halichoerus* recognized by many zoölogists represent but the variations of a single one. The presence of six molars, either on one or both sides of the upper jaw, in 8 out of 34 skulls examined, is noted, and is regarded as representing a tendency to reversion rather than an abnor-

mality or monstrosity. The general principle is laid down, that the number and form of teeth in mammals are no less subject to modifications than the amount or color of pelage, the length of the ear or tail, or the proportions of the skeleton. The article closes with remarks on the proportions of the skeleton, and the geographical distribution and abundance of the species. The author inclines to doubt the opinion broached to him by Gerstäcker; namely, that the gray seal is the most abundant species in the Baltic. — (*Sitz.-ber. gesell. naturf. fr. Berl.*, 1882, 117.) F. W. T. [465]

Mammals as weather-prophets. — Dr. C. C. Abbott showed that the autumnal habits of certain animals that are popularly supposed to be indicative of the character of the coming winter could not be depended upon; although, by the majority of people living in the country, they were considered as sure indications of what the winter would prove to be. Dr. Abbott had kept a careful record, extending over twenty years, regarding the building of winter houses by muskrats, the storing of nuts by squirrels, and other habits of these and other mammals, and had found that the habits referred to, or their omission, in certain autumns, bore no relation to the character of the coming winter. — (*Trenton nat. hist. soc.*; meeting Feb. 13.) [466]

ANTHROPOLOGY.

Ethnography of Kordofan. — Dr. Peney, physician-in-chief of eastern Soudan, sends to Dr. Hamy of Paris a description of the inhabitants of Kordofan. The country is held principally by Arab tribes; and even the negroes were converted to Islamism under that great revival which subjected all northern Africa to the faith of the Prophet. The class of fakirs, or revivalists, is very graphically described, and their power over the natives. A custom of allowing the females of the tribe to do just as they please one day in four, exists among the Hassanichs. — J. W. P. [467]

The religions of savages. — M. A. Reville is the author of a work upon the religions of peoples non-civilized, published in Paris by Fischbacher. Mr. A. Lang, reviewing this work, criticises the author for relying too much upon older authorities and upon mere compendiums, but gives him credit for seeing the true import of many superstitions of lower races that have no reason for us. — (*Academy*, Jan. 13.) [468]

Brains of great men. — Gen. Skobelev, the hero of Plevna, after death was subjected to a rigorous autopsy. The circumference of his head was 57 centimetres; of the skull, 54; antero-posterior diameter, 18 centimetres; transverse, 14. The brain weighed 1,457 grms. The brain of Gambetta is deposited in the laboratory of the school of higher studies, and will be described by M. Mathias Duval of the Society of mutual autopsy, to which M. Gambetta also belonged. — J. W. P. [469]

Woman among the Kabyles. — The indigenes of Algeria are among the most interesting portions of the human family. As specimens of humanity, as a composite ethnic residuum, as the repository of features in civilization that have long since been wanting among those with whom they originated, the Berbers have attracted a wide attention. The Kabyles are the modern Berber representatives of the ancient Numidians, familiar to classical scholars in the story of Jugurtha. M. Camille Sabatier has passed some time among these people, and gives us the benefit of his experiences. To those coming from an Arab population, the most striking fact in Kabyle life is the liberty of going and coming ac-

cording to females of all ranks, and on all occasions. Although the poor are very miserable, they are not disheartened; and every care is solaced by a gaudy wrapping, or some tawdry jewelry. While the birth of a son is an occasion of rejoicing, the daughter is an evil omen. It is only when she arrives at a marriageable (marketable) age, that the parents awaken to a consciousness of her existence. All the forces of her education combine to render her vigorous, servile, and revengeful, and to banish love from her heart. The rite of marriage and of bride-sale are described in the graphic style of an eye-witness, and the future of the Kabyles briefly foretold. — (*Rev. d'anthrop.*, Jan., 1883.) J. W. P. [470]

Mollusks and civilization. — If all the tribes of men were arranged upon the squares of a modern city, so that by walking eastward and westward we could visit the peoples of the whole earth, they could each be so arranged, that, by going northward and southward, the student of special topics might study the phases of his pet pursuit among the various races. Dr. de Rochebrune has chosen this latter method of study, and has taken the word 'mollusk,' or shell, as his talisman. The use of this animal as food, and of its test in art and ornament, has existed among all peoples, ancient and modern. Others have already gone over the ground, — Stearns, Yates, Barber, Wyman, and Martens, for instance; but the author, having enjoyed especial advantages in the museum of the Trocadero, is able to present something new on the subject of ethnographic conchology. The first memoir is upon the mollusks in the graves of lower Peru. The species used for food as well as for ornament are minutely identified. They are twenty-seven in number, and some of them evidently had been brought a great distance. — (*Rev. d'ethnogr.*, No. 6, 1882.) J. W. P. [471]

Mound-builders' pipes. — The curator presented for inspection a collection of thirteen of the 'curved-base' mound-builders' pipes just received from that indefatigable explorer and collector, Rev. J. Gass. These pipes were collected the past year from the mounds in Muscatine, Rock Island, and Mercer counties, by Mr. Gass, his brother, and some neighbors; and he has recently acquired full possession of them for the benefit of the academy, with a full description of the mounds, their structure, etc.

One of these pipes is a finely carved stag's-head, representing the antlers bent around the bowl, and carved in relief; another is an eagle, perched, and holding some small animal in its claws; and two others are neatly carved birds. These four are of ash-colored pipestone. Another is a finely sculptured black bear, and is very appropriately cut in a smooth, fine-grained blackstone. The sixth is supposed to represent a fox with the face turned backward, carved in a beautiful bright red catlinite. The seventh, a non-descriptive animal, is also cut in red catlinite, very much spotted.

Two of plain form are composed of plain red catlinite. The other four are made of a light-brown stone, rather small, and of the simplest form.

There is also an 'axe' of the exact usual form of the plano-convex copper axes, so-called, which is also made of the catlinite, or red pipestone, and a small charm of the same material.

This constitutes a very important addition to this already unequalled collection of the relics of the mound-builders, and brings the collection of pipes of this typical form up to the number of fifty-six, including several unfinished specimens, and by far the largest collection of its kind in the world. — (*Davenport acad. sc.*; meeting Feb. 23.) [472]

NOTES AND NEWS.

—The Compendium of the tenth census, which is now being distributed by the interior department, is comprised in two octavo volumes, each of about 900 pages. This is about double the size of the compendium of the ninth census. This great increase is produced in the main by the introduction of more detailed tables, and of subjects which were not taken up by the ninth census, or, if taken up, their statistics were not summarized in the compendium.

The contents of the work before us may be summarized as follows: to the statistics of population, including, as allied topics, occupations, illiteracy, the defective, dependent, and delinquent classes, and mortality, are given about 800 pages. These include the statistics of the aggregate population, of race and nativity, by states, counties, and minor civil divisions; a classification of the native population by state of birth, and of the foreign element by country of birth; and the statistics of sex and age. The latter are very full, comprising, among others, a table giving the number in each state of each successive year of age.

This matter is followed by the statistics of agriculture, which occupy about 275 pages. These comprise, in general terms, the area and size of farms, extent of cultivated land, and the vegetable and live-stock productions. They are given by states and counties.

The statistics of manufactures, which follow, occupy about the same number of pages as those of agriculture. These are particularly full and complete, containing, besides tables of general statistics by states and counties, the statistics of no less than 332 different industries. Tables of power used in manufactures, a subject new to the census, follow. The statistics of mineral production, petroleum, and of quarries, succeed; then those of railroads, steamcraft, canals, telegraphs, and telephones. Statistics of occupation are sandwiched in between the last and those of fisheries. Then follow foreign parentage, areas, families, and dwellings; Alaskan statistics; fire, life, and marine insurance; wealth, debt, and taxation; illiteracy and public schools; the defective, dependent, and delinquent classes; and, as a fitting finale, mortality.

As will be noticed, the arrangement of the work is not all that could be desired. While the great bulk of the statistics regarding the population are grouped in the earlier part of the work, a number of subjects closely related to it are scattered in toward the end. It is very probable that this was a necessity, growing out of the order, in time, in which the different subjects were prepared for publication.

As this work contains abstracts of all the statistical matter of the census, its completion presupposes that of the more extended tables, which form the statistical matter of the full reports; and their appearance

may be expected as rapidly as the capacity of the Government printing-office will permit.

—The third meeting of German geographers will be held at Frankfort-on-the-Main on the 29th, 30th, and 31st of this month. As at the previous meetings at Berlin and Halle, the morning sessions will be given up to scientific addresses, and the afternoons to questions of school method. There will also be an exhibition of geographic teaching-material, to remain open for two or three weeks.

—As the city of Buenos Aires was separated from the province of the same name in December, 1880, and made federal territory, it has been decided to establish a new city for the provincial capital, to be called La Plata. Its first foundations were laid Dec. 9, 1882, about twenty-five miles east of Buenos Aires, and three miles west of the harbor of Ensenada.

—Professor Owen, in the Proceedings of the Zoölogical society of London for 1882 (p. 571), objects to the current statement that Hilton was the first to discover the Trichina spiralis, and points out that Hilton saw only the calcified cysts in the muscles of cadavers. To Professor Owen himself properly belongs the honor of the important discovery of the parasitic worm,—a discovery which has led to the prevention of so much suffering by having guided us to the means of avoiding trichinosis.

—For the past five years the Department of agriculture has been endeavoring to encourage the production of raw silk in the United States by the dissemination of eggs, and by publishing for free distribution a manual of instruction. A definite impulse to the industry was looked forward to, when the tariff commission recommended that a small duty be placed upon reeled silk and cocoons; but this recommendation was unheeded by the Senate committee having the bill in charge. A most interesting discussion was brought out, however, by the amendment offered by Senator Morgan of Alabama, Feb. 8, to strike out those articles from the free-list, and to place a duty of ten per cent *ad valorem* upon them. Senator Morgan defended his amendment in a very able manner, and was seconded by Senator George of Mississippi. The amendment was defeated by a vote of 39 yeas to 7 nays. Strangely enough, the two principal arguments were diametrically opposed to each other. Senator Hawley of Connecticut stated that the production of silk had been attempted in this country, at intervals, for two hundred years without success, and held that it could not succeed with all the protection the government could give it; while Senator Ingalls of Kansas pictured in glowing colors the success attained by M. de Boissière at Silkville, Kan., and argued, that, while such results are possible without an import-duty, the necessity for levying such a tax does not exist. As a commentary on this latter argument, we may state that Boissière's silk-experiment is now, and has been for some years,

at a stand-still, solely because stock-raising and general farming have proved more profitable as an investment.

The report of the entomologist of the department, recently issued, confirms all that has been hitherto said as to the adaptability of our country to this industry, and as to the value of the osage orange (*Maclura aurantiaca*) as silk-worm food. But while there can be no question on these points, or as to the desirability of permanently establishing so important an industry, he has felt it necessary to dissuade rather than encourage large enterprise in this direction, for the simple reason, that, under existing conditions, the investors must needs meet with disappointment. He remarks, "Those who have eggs for sale, or who are interested in the propagation and sale of mulberry-cuttings, and those who are influenced by philanthropic or benevolent motives, can afford, albeit from opposite motives, to stimulate in every possible way the interest naturally felt in the subject; but the disappointment, under existing circumstances, is apt to be great in proportion as the interest increases, so that there is danger of a repetition of the many reactions from similar attempts in the past. This follows necessarily from the fact that the reeled silk is imported free of duty, while there is so very heavy a duty on the woven goods.

"There is a duty to-day, on wools valued at 32 cents, of 10 to 11 cents per pound, and 10 per cent *ad valorem*. Still, in past years, as in 1846, wool has been imported free of duty. Now, wool is essentially a raw product, having gone through no expensive process of manufacture; yet what would our wool-growers throughout the country say, if it were proposed to do away with the duty, and allow wool to come in, as reeled silk is now allowed to come in, free? They would, no doubt, declare that such action on the part of Congress would give the death-blow to wool-growing in the United States. Silk-culture is in just the condition that wool-growing would be in under such circumstances; and if there is any advantage to the country in the protection of one kind of silk-manufacture, then, logically, that other branch of silk-manufacture, namely, silk-reeling, which would add value to the cocoon, and give encouragement to its production, should also be protected."

He remarks that the 'raw silk' now imported, to the value of over twelve million dollars, is a manufactured article, requiring unusual skill and intricate machinery, and that its introduction free of duty is as much an encouragement to foreign manufacturers as the removal of the duty would be on the woven goods.

—The January number of *The Virginias*, the excellent mining journal edited by Major Hotchkiss, and devoted to the industrial development of the two Virginias, contains a rough map of the Cabin creek coal company's lands, lying south of the Kanawha

valley, with sections and borings, in illustration of two reports upon the coal and timber lands of the company by Prof. S. P. Sharples and Capt. I. A. Welch, which are printed in full. The same number contains a reprint of Hitchcock's paper before the mining-engineers in 1882, on the Crystalline rocks of Virginia compared with those of New England, and Notes on the geology of the Virginias from the notebooks of the Virginia geological survey of 1835-41, by the late Prof. W. B. Rogers, toward whom Major Hotchkiss stands as literary executor so far as his Virginia work is concerned. It also contains, from the same papers, a geological section of the Ohio river hills at Wheeling, now mostly buried under heaps of slag and cinder, and a careful analysis of the same by Prof. I. C. White. We trust the people of Virginia appreciate Major Hotchkiss's work.

—The officers of the Paris anthropological society for the present year are: president, Dr. Proust; vice-presidents, Dr. Hamy and Dr. Dureau; general secretary, Dr. Topinard; assistant, M. Girard de Recille; annual secretaries, Dr. Prat and M. Issaurat; committee on publication, M. de Quatrefages and Dr. Parrot; curator of the museum, Dr. Collineau; treasurer, M. Leguay; librarian, M. Vinson.

The school of anthropology was opened on Nov. 4, 1882, with the following courses:—*zoological anthropology*, M. Mathias Duval, on anthropology and embryology compared, Darwinism, cerebral convolutions;—*general anthropology*, Dr. Topinard, on the history of anthropology, observations and measurements to be made upon the living by travellers;—*ethnology*, M. Dally, description of races, geographical distribution, crossing, degeneration, affiliations, evolution;—*prehistoric anthropology*, M. de Mortillet, protohistory, religion from an ethnic point of view, development of arts, and the origin of agriculture and industry;—*medical geography*, M. Bordier, influence of social environment upon the progress and spread of diseases;—*demography*, M. Bertillon, statistics of marriage, births, and deaths in the different countries of Europe.

—Rev. Henry C. McCook of Philadelphia is engaged upon an illustrated book on 'American spiders and their spinning work,' and hopes to have a volume on the 'Industry and habits of orbweavers' ready by midsummer.

—The Manitoba historical and scientific society has published as its 'Transaction No. 3' a paper by J. Hoyes Panton, late of the Ontario agricultural college, on the Geology of the Red-river valley, in which the author looks forward to the time when the city of Winnipeg will become dependent, for its water-supply, upon the Lake of the Woods, seventy miles distant.

—The curator of the Peabody academy of science, of Salem, reports that winter classes in botany, averaging more than fifteen regular attendants for the

last four years, and increasing rapidly, have been formed. A newly discovered shell-heap in Ipswich has been opened, and every specimen of value saved; giving the only single shell-heap contents, as yet systematically preserved, from this county. In the early spring some 75 hardy western catalpa-trees, from five to eight feet high, were distributed gratuitously to persons in the county who would give the tree a fair trial, and report results.

—The meteorological bureau of Ohio proposes to establish a system of weather-signals to be displayed on railway trains, making use, of course, of the predictions furnished by the U. S. signal service. Arrangements have already been made with one road leading out of Columbus; and a system of signalling will be put in operation as soon as the best form of signals can be determined upon.

—The chief publications on natural science issued in Bengal the past year were catechisms of sanitation and hygiene for use in the schools in Bengal, and text-books of algebra, arithmetic, and physical geography. Baboo Kási Charan Gupta published the first volume of a Bengalese translation of an English work upon surgery.

—The lecture of Major J. W. Powell, upon Indian mythology, which was announced in the programme of the Washington Saturday scientific course for the 10th inst., was not delivered, owing to the illness of the lecturer. Mr. G. K. Gilbert, who acted as substitute, spoke upon the Ancient lakes of the Great Basin.

—Geographers and meteorologists will regret to learn that the bill making appropriations for the Signal-service of the U. S. army, which passed the last Congress, requires the parties at Point Barrow and Lady Franklin Bay to be recalled, if possible, from the field. It appears that the bill would have been mandatory were it not for the doubt as to whether Lady Franklin Bay can be reached next summer; and, in any case, we may expect the Point Barrow party to be withdrawn. An attempt will be made, however, to utilize the relief expedition to the last locality, by observations with the pendulum, etc., during the stay of the vessel. It is to be hoped, at least, that the observations will not be interrupted before the end of September; since several of the international parties did not get well at work before that time in 1882, and the observations for one co-operative year will not be complete if any of the parties are interrupted in their work at an earlier date in 1883.

—The report of the Board of commissioners of the Second geological survey of Pennsylvania to the legislature, Jan. 1, 1883, contains a colored map showing the progress of the survey up to Dec. 31, 1882. There remains unsurveyed a large part of Huntingdon and Centre counties, a small part of Clinton, and parts of Schuylkill, Carbon, Berks, Bucks, Montgomery, and Clearfield counties. In the anthracite region a

number of underground maps have been prepared. Twenty such are finished, and with them a number of accompanying sections. The appropriation for the anthracite work is not sufficient; and they estimate the cost of completing it at \$50,000, and the time necessary at three years.

The Chester and Delaware county reports (C 4 and 5), the Warren county report (I 4), and the Lehigh and Northampton report (D 3), will be issued shortly, as soon as the rest of the illustrations are printed.

It is to be hoped that the legislature will provide the necessary funds for the completion of the valuable work of this survey, and that a general index will be prepared, rendering the work of the survey more accessible than it is at present, owing to the large number of volumes, and the somewhat imperfect tables of contents or indexes attached to each volume. We also hope for some contributions from the survey to American paleontology, in addition to Lesquereux's memoirs on the fossil floras, and are sorry to see no mention of any such work.

—At a meeting of the Ohio state forestry association, March 10, it was decided to call a general state convention in the interests of forestry, to be held in Cincinnati, April 26 and 27. Communications, both scientific and practical, are solicited by the secretary, Adolph Leué, Camp Washington, Cincinnati, O.

—The census office has recently published a bulletin concerning the timber resources of West Virginia (No. 25 of the Forestry series). The forests consist chiefly of broad-leaved trees, the narrow-leaved trees (white pine and spruce) being confined chiefly to the higher mountains. The white pine covers about 310 square miles, which are estimated to contain 990,000,000 feet of merchantable lumber. The broad-leaved forests consist in the main of white and chestnut oaks, black walnut (which is wide-spread, but most abundant in the south-west), yellow poplar, and cherry (which is abundant in Greenbrier, Nicholas, and Webster counties, and the country adjoining them).

The lumber product of the state during the census year was valued at \$2,431,857. Along the Ohio and its principal branches, especially in the north-western part of the state, all the valuable timber has been cut.

The bulletin is accompanied by a map, showing, in colors, the different classes of forests, and the area from which the valuable timber has been removed.

—Mr. James C. Pilling, of the Bureau of ethnology at Washington, has published in a separate pamphlet his Catalogue of linguistic manuscripts in the library of the Bureau of ethnology, which first appeared in Major Powell's first annual report. The vocabularies of Schoolcraft, Gibbs, Gallatin, Hale, and the Smithsonian institution, have been used for many years in gathering Indian linguistic material. Some of these have been published; others had been

lying in the archives of the Smithsonian, until Major Powell, in 1876, received them to be "consolidated and published in connection with like material collected by himself and his assistants while among the Indians in the western portion of the United States." A succinct account of the work accomplished by the bureau completes Mr. Pilling's introduction. Major Powell has issued a more elaborate introduction to the study of Indian languages than the instructions of his predecessors, of which the analysis will be found at the close of Mr. Pilling's preface. Besides those printed in former volumes, over three hundred manuscripts of various extent, from thick tomes down to a few pages, remain to be elaborated, and put in print. Mr. Pilling has in type, as far as the letter M, an exhaustive bibliography of North-American Indian linguistics, bringing the subject down to the hour of going to press. He goes to San Francisco this month to consult the Bancroft library.

—Rogozinski and his party, including a geologist, meteorologist, engineer, and mechanic (all Poles), sailed from Havre Dec. 13, 1882, for Fernando-Po, on his African expedition.

—The proceedings of the Belfast nat. hist. and phil. soc., for 1881-82, contain, among other articles, papers by J. J. Murphy on the rainy or post-glacial period, and by Professor Cunningham, on corals and coral islands. The former claims, that, as the astronomical causes which produced the snowy or glacial climate faded away, the rainfall remained heavy for a time, as is shown by the deposits in the bogs of Norway, and the shore terraces of our extinct western lakes. It is supposed that the glacial time was preceded by similar rainy conditions, but their record is lost. The latter gives a general review of the question, and calls attention to Murray's view, that subsidence is not necessary to explain any of the characteristic features of barrier reefs or atolls. They might equally well be produced in regions of rest, or slow elevation as well as depression. The atoll form is taken because the chief supply of food for the coral polyps is on the outer margin, and the rock is carried away from the interior by solution.

—Dr. Cohn of Vienna describes two manuscripts of Dioscorides, on parchment, now in the imperial library at Vienna, which date from the latter half or the fifth century, and are still, for the most part, well preserved. One is known as the *Codex Constantinopolitanus*, the other as the *Codex Neapolitanus*; the former having been made for a grand-daughter of Emperor Valentinian III. at Constantinople, afterwards coming into the possession of the Turks, and in 1570 purchased for the imperial library, from the family of a former physician to Sultan Soleiman, for a hundred ducats. It consists of about four hundred folio leaves of fine vellum between worm-eaten wooden covers, with illuminated title, dedication, and

other prefatory pictures, followed by the botanical figures and text. Two opposite pages are given to each plant,—on one side the drawing, with the name and synonyms; and on the other, the description in cursive character, without spacing, punctuation, or accent, together with various citations in Arabic, Greek, and Hebrew. The paintings in both codices are evidently copies from the same originals; and though somewhat conventional, and more or less incorrect or imperfect as to details, yet the general and often the specific characters of the plants are preserved in a remarkable degree.

Under the Empress Maria Theresa, and at the instigation of Gerard van Swieten, court physician and librarian, the figures of the *Codex Constantinopolitanus* were carefully engraved upon copper; but only two impressions are known to have been taken. One of these was sent by order of the empress to Linné, and is now in the possession of the Linnean society of London, in an imperfect condition. The second was given by Joseph Jacquin (or only loaned, as afterwards was claimed by Jacquin the younger) to Sibthorpe, from whom it passed by bequest, with the rest of his library and collections, to the University of Oxford, which still holds it.

—The eleventh annual report of the curator of the Museum of Wesleyan university, Middletown, Conn., records some noteworthy accessions to the museum, particularly of Australian marsupials, and of the Sheldon collection of minerals. Attention is called to the fact, that this includes several specimens of the rare mineral samarskite from Portland, Conn. "This mineral, first discovered in the Urals, afterwards found to occur more abundantly in North Carolina, has never hitherto, to the writer's knowledge, been reported from this vicinity."

—At a meeting of the Philosophical society of Washington, March 10, a paper by Mr. M. H. Doolittle, on Substance, matter, motion, and force, elicited an animated discussion. He was followed by Mr. E. B. Elliott, who developed a new formula for the computation of the position of Easter in any year, past or future.

—Rev. E. E. Hale of Boston invites the editor to introduce his wonderful friend, Col. Ingham, to the readers of SCIENCE. In that fabled city of Sybaris, Col. Ingham observed in 1859 a similar contrivance to that mentioned in our summary, paragraph 102. Let us quote him:—

"I sat quite in the front of the car, so that I could see the fate of my first friend, *Παρίος*,—the full car. In a very few minutes it switched off from our track, leaving us still to pick up our complement; and then I saw that it dropped its mules, and was attached, on a side-track, to an endless chain, which took it along at a much greater rapidity, so that it was soon out of sight. I addressed my next neighbor on the subject, in Greek which would have made my fortune in those old days of the pea-green settees. But he did not seem to make much of that, but, in sufficiently good Italian, told me, that, as soon as we were full, we

should be attached in the same way to the chain, which was driven by stationary engines five or six stadia apart; and so, indeed, it proved. We picked up one or two market-women, a young artist or two, and a little boy. When the child got in, there was a nod and smile on people's faces. My next neighbor said to me, *Παίπες*, as if with an air of relief; and, sure enough, in a minute more we were flying along at a 2.20 pace, with neither mule nor engine in sight, stopping about once a mile to drop passengers, if there was need, and evidently approaching Sybaris." — (*Sybaris and other homes*, pp. 32, 33.)

RECENT BOOKS AND PAMPHLETS.

Continuations and brief papers extracted from serial literature without repagination are not included in this list. Exceptions are made for annual reports of American institutions, newly established periodicals, and memoirs of considerable extent.

Adam, Lucien. Du genre dans les diverses langues. Paris, *Maisonneuve*, 1883. 36 p. 8°.

Bertrand, O. Guide des trois musées du Jardin des plantes. Paris, *Bandot*, 1883. 96 p. 18°.

Cardot, J. Muscinées du département de la Meuse, catalogue des mousses et des hépatiques recueillies aux environs de Stenay et de Montmédy. Montmédy, *imp. Pierrot*, 1883. 42 p. 8°.

Chopy, S., et Dampierre, E. de. De la reconstitution des vignobles de la Saintonge à l'aide des plants américains, traitant du greffage du plant américain sur la vigne française phylloxérée. Paris, *Marchal, etc.*, 1883. 28 p. 8°.

Clerke, D. The theory of the gas engine. N.Y., 1883. 160 p. 12°.

Curtis, M. M. The cause of variation. Marshall, Minn., *Author*, 1882. 115 p. 8°.

Dorlhac, J., et Amiot, G. Géologie des bassins houillers de Brioude, de Brassac et de Langenc. Paris, *imp. Quantin*, 1883. 323 p. 4°. 19 pl. f°.

Dubois, A. Histoire naturelle vulgarisée; ornithologie populaire. 4 tom. Limoges, *Barbou*, 1883. 124, 124, 125, 69 p. 12°.

— La science populaire. Dans les bois, notions populaires d'histoire naturelle. Limoges, *Ardat*, 1883. 304 p. 8°.

Du Moncel, Theodore. Electro-magnets; the determination of the elements of their construction; transl. from 2d ed. N.Y., *Van Nostrand*, 1883. 122 p. 24°.

Echo (l') des inventeurs, journal mensuel illustré, scientifique, littéraire et politique. 1. ann. no. 1. Marseille, *imp. Blanc*, 1er janv., 1883. 4 p., carte. sm. f°.

Fabre, J. H. Nouveaux souvenirs entomologiques: Études sur l'instinct et les mœurs des insectes. Paris, *Delagrave*, 1883. 389 p. 18°.

Fennel, Otto. Die Wagner-Fennel'schen tachymeter der mathematisch-mechanischen instituts von O. F. in Cassel. Cassel, *Freyschmidt*, 1882. 43 p., 7 pl. 8°.

Foëx, Gustave, et Viala, Pierre. Ampélographie américaine. Album des raisins américains des variétés les plus intéressantes cultivées à l'école nationale d'agriculture de Montpellier, photographies d'après nature par M. S. Isard; 80 à 90 planches photographiques, accompagnées d'un texte descriptif des cépages et d'une introduction à l'étude de la vigne américaine. Livr. 1. Montpellier, *Grollier*, 1883. 2 p., 2 pl. f°.

Fouque, F., et Lévy, A. M. Introduction à l'étude des roches éruptives françaises; minéralogie micrographique (Mém. expl. carte géol. France). Paris, *imp. Quantin*, 1883. 6+315 p., illustr. 4°; atlas, 55 pl. 4°.

Gilder, William H. Ice-pack and tundra; an account of the search for the Jeannette and a sledge journey through Siberia. N.Y., *Scribner*, 1883. 10+344 p., illustr., maps. 8°.

Girard, Jules. La Nouvelle-Guinée; historique de la découverte, description géographique, la race papoue, mœurs et coutumes des indigènes, produits du sol, colonisation. Paris, *imp. Lezé*, 1883. 55 p. 8°.

Glazebrook, R. T. Physical optics. London, 1883. 448 p. 8°.

Gruey, L. J. Le Stréphoscope universel. Paris, *Chazé*, 1883. 32 p., illustr. 8°.

Harrington, M. W. Report on the mortuary experience of the Michigan mutual life insurance company, from its organization [in 1876] to Jan., 1882. Detroit, *Company*, 1883. 27 p., pl. 8°.

Houghton Farm experiment department. Agricultural physics, 1882. Series 1. nos. 1 and 2. Meteorology and soil

temperatures, by D. P. Penhallow. Newburgh, *Ritchie & Hull*, *pr.*, [1883]. 57 p., 5 pl. 8°.

In memory of William Barton Rogers, late president of the society. Boston, *Society of arts*, 1882. 39 p., portr. 8°.

Iowa weather service annual, 1883. Iowa City, *Central Station*, 1883. 44 p., illustr. 8°.

Jeffries, Benjamin Joy. Color-blindness; its dangers and its detection. *Rev. and enl. ed.* Boston, *Houghton, Mifflin & Co.*, 1883. 18+334 p. 12°.

Kleinberg, N. Carlo Darwin e l'opera sua. Messina, 1882. 31 p. 16°.

Langlobert, J. Applications modernes de l'électricité; nouvelles machines magnéto-électriques et dynamo-électriques; éclairage électrique; téléphone etc. Paris, 1883. 106 p., illustr. 12°.

Lommel, Th. G. Examen critique des nouveaux essais de tracé entrepris sous les auspices de la Compagnie Suisse Occidentale-Simplon pour la rampe d'accès méridionale du tunnel alpin du Simplon. Lausanne, 1883. 73 p., carte, tracé. 1. 8°.

Luke, A. Sammlung trigonometrischer Aufgaben nebst einer Anleitung zur Lösung derselben. Heft 1: Goniometrische Aufgaben. Halle, 1883. 8°.

Lyman, Benjamin Smith. On the utility of the Pennsylvania state geological survey in the anthracite field. Read [by title] before the American institute of mining engineers, Feb. 23, 1883. *n.p., n.d.* 8 p. 8°.

Mennant, J. Empreintes de cachets Assyro-Chaldéens relevés au Musée britannique sur des contrats d'intérêt privé. Paris, *Maisonneuve*, 1883. 51 p., illustr. 8°.

Métallurgiste (Le), organe des chambres syndicales ouvrières, de la métallurgie. 1. ann. no. 1. Lille, *imp. Ragache*, 17 Dec., 1882. 4 p. sm. f°.

Montreal. McGill university. Report on the Peter Redpath museum. No. II. [Montreal], 1883. 22 p. 8°.

Morris, Herbert W. The celestial symbol interpreted; or the natural wonders and spiritual teachings of the sun, as revealed by the triumphs of modern science. Phil., *McCurdy*, 1883. 704 p. 8°.

Natura. Maandschrift voor Natuurwetenschappen. Jaarg. 1, Gent, 1883. 8°.

Penn. — Second geological survey. Report of the board of commissioners to the legislature, Jan. 1, 1883. *n.p., n.d.* 7 p., map. 8°.

Pisani, F., et Dervell, P. La chimie du laboratoire. Paris, *Baillière*, 1883. 402 p. 18°.

Poulsen, V. A. Microchimie végétale, guide pour les recherches phyto-histologiques, à l'usage des étudiants; trad. par J. P. Lachman. *Ed. franç.* considérablement augmentée (en collaboration avec l'auteur). (Bibl. biol. intern.) Paris, *Dois*, 1883. 20+119 p. 18°.

Révill, B. H. A travers les prairies; les peaux-rouges de l'Amérique du Nord; excursions, chasses, etc. Limoges, *Ardat*, 1883. 304 p. 8°.

— Au pôle et sous les tropiques, histoires recueillies par un voyageur autour du monde. Limoges, *Barbou*. 288 p. 8°.

— Voyage autour du monde, histoire recueillies par un voyageur. Limoges, *Barbou*, 1883. 144 p. 8°.

Schröter, C. Die flora der eiszelt. Zürich, *Wurster*, 1882. 41 p., pl. 4°.

Scudder, Samuel H. The pine moth of Nantucket, *Retinia frustrana*. (Publ. Mass. soc. prom. agric.) Boston, *Williams*, 1883. 22 p., pl. 8°.

Smith, J. Alden. Report on the development of the mineral, metallurgical, agricultural, pastoral, and other resources of Colorado for the years 1881 and 1882. Denver, *Chain & Hardy*, 1883. 159 p. 8°.

Southack, Albert P. Question book of zoölogy with notes, queries, etc. Syracuse, *Bardeau*, 1883. 40 p. 16°.

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